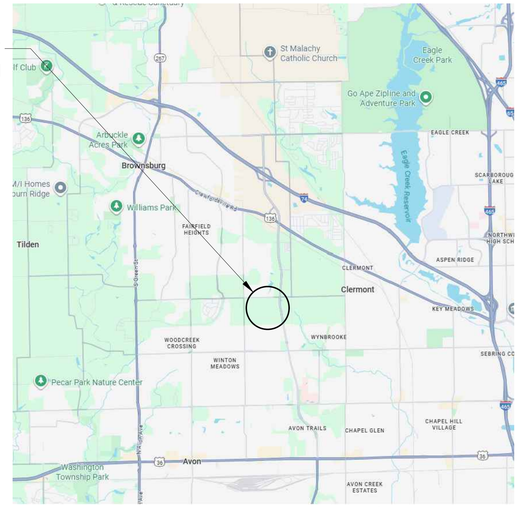
RESERVE AT RONALD REAGAN INFRASTRUCTURE PHASE 1

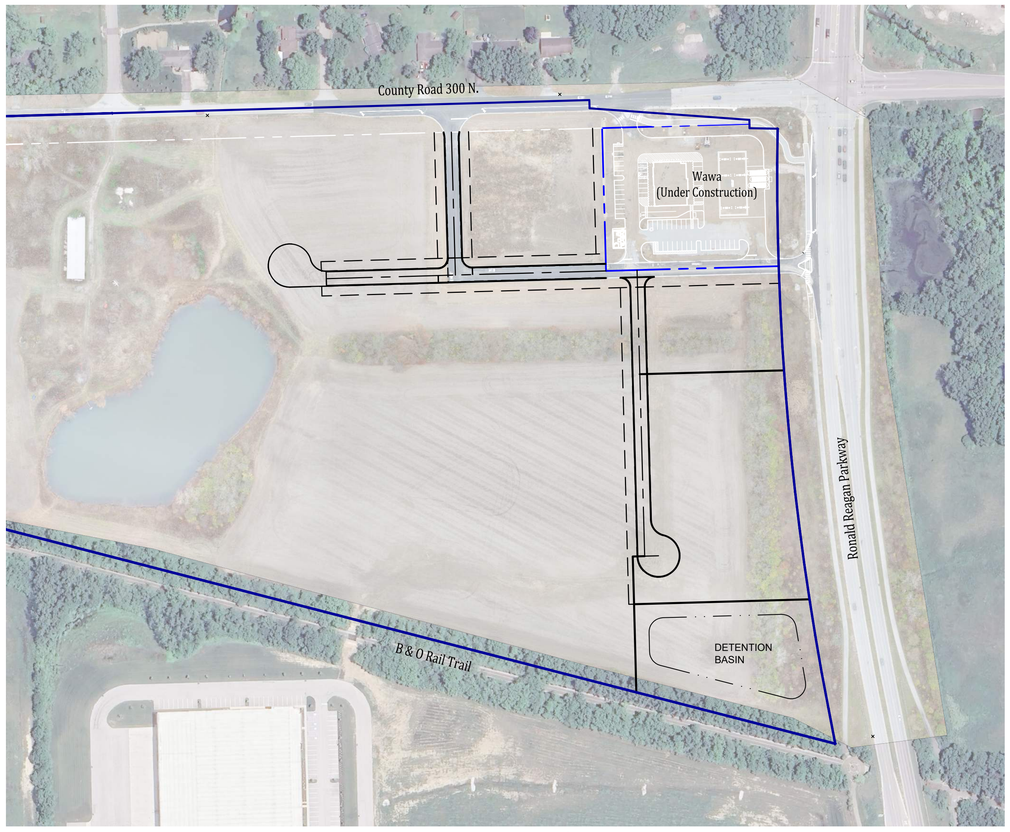
NW 1/4-SEC. 30T16N-R2E, HENDRICKS COUNTY, LINCOLN TOWNSHIP, BROWNSBURG, INDIANA
PROJECT ADDRESS: 9501 E. COUNTY ROAD 300 N.
ZONED: M2 & C3

PLANS PREPARED FOR:
R2 CORRIDOR, LLC
9589 VALPARAISO CT.
INDIANAPOLIS, IN 46264
317-580-9693
CONTACT: STEVE PITTMAN
EMAIL: steve@pittmanpartners.com

PROJECT LOCATION

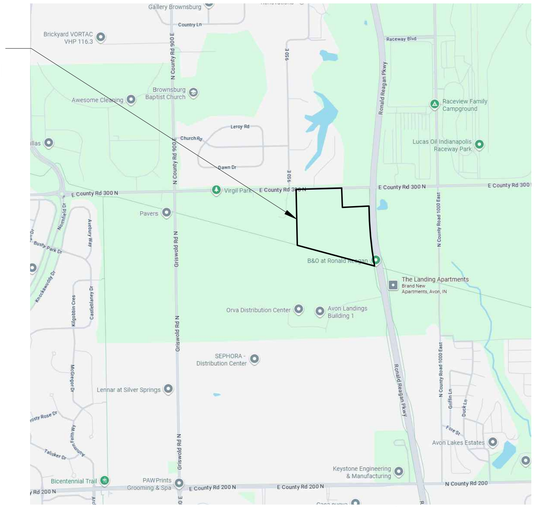


VICINITY MAP
NO SCALE



SITE MAP
SCALE: 1"=150'

PROJECT LOCATION



LOCATION MAP
NO SCALE

OPERATING AUTHORITIES

GAS
Centerpoint Energy
2345 E. Main Street
Danville, IN 46122
317-718-3616

ELECTRIC
Hendricks Power Cooperative
68 N. County Road 500 E.
Avon, IN 46123
317-745-5473

SANITARY
Hendricks County Regional
Sewer District
355 S Washington Street, #206
Danville, IN 46122
317-718-6038
Contact: Jim Mardis

SCHOOL DISTRICT
Brownsburg Community
School Corporation
310 Stadium Drive
Brownsburg, In 46112
317-852-5726

STORM
Town of Brownsburg
Stormwater Department
225 S. Mardale Dr.
Brownsburg, IN 46112
317-858-6029

SANITARY
Aqua Indiana
5750 Castle Creek Parkway
North Drive, Suite #314
Indianapolis, IN 46250
317-716-6026
Attn: Kieran Tansy

FIBER OPTIC
Everstream
342 Massachusetts Ave., Suite 203
Indianapolis, IN 46237
3127-460-4783

FIBER OPTIC
Hendricks Power HP Connect, LLC
68 N. County Road 500 E.
Avon, IN 46123
317-745-5473

WATER
Citizens Enerty Group/
CWA Authority, Inc.
2150 Dr. Martin Luther King Jr. Street
Indianapolis, IN 46202
317-927-4351

TELEPHONE
AT&T
240 N. Meridian Street
Indianapolis, IN 462045
317-722-2299

FIRE DEPARTMENT
Brownsburg Fire Territory
470 East Northfield Drive
Brownsburg, IN 46112
317-852-1190

IMPERVIOUS AREA	
ASPHALT:	28,918 SF
GRAVEL:	7,923 SF
CONC. CURB:	6,229 SF
TOTAL:	43,070 SF

SHEET INDEX

SHEET NO	DESCRIPTION
C100	TITLE SHEET
C101	EXISTING TOPOGRAPHY & DEMO PLAN
C102	OVERALL PLAN
C103-C105	SITE LAYOUT PLAN
C110	OVERALL GRADING PLAN
C111-C113	GRADING AND DRAINAGE PLAN
C114	FLOOD ROUTING PLAN
C300	OVERALL UTILITY PLAN
C310	SANITARY PLAN AND PROFILE
C320-C321	STORM SEWER PLAN AND PROFILES
C330-C332	WATER MAIN PLAN
C400-C402	INITIAL EROSION CONTROL PLAN
C403-C405	FINAL EROSION CONTROL PLAN
C406	STORM WATER POLLUTION PREVENTION PLAN
C500	EROSION CONTROL DETAILS
C501	MISCELLANEOUS DETAILS
C502	STORM SEWER DETAILS
C503	WATER MAIN DETAILS
	HENDRICKS REGIONAL SEWER DISTRICT DETAILS

REVISIONS

NUMBER	DESCRIPTION	DATE

Indiana 811
Know what's below. Call before you dig.

PLANS PREPARED BY:
BANNING ENGINEERING
853 COLUMBIA ROAD, SUITE #101
PLAINFIELD, IN 46168
BUS: (317) 707-3700, FAX: (317) 707-3800
E-MAIL: Banning@BanningEngineering.com
WEB: www.BanningEngineering.com
CONTACT: RYAN LINDLEY
EMAIL: rlindley@banning-eng.com

CONSTRUCTION DOCUMENTS

PROJECT MANAGER:_____ DATE:_____

THESE PLANS ARE NOT TO BE CONSIDERED FINAL OR TO BE UTILIZED FOR CONSTRUCTION UNLESS SIGNED AND DATED BY THE APPROPRIATE BANNING ENGINEERING PROJECT MANAGER.

THESE PLANS ARE NOT INTENDED TO BE REPRESENTED AS A RETRACEMENT OR ORIGINAL BOUNDARY SURVEY, A ROUTE SURVEY, OR A SURVEYOR LOCATION REPORT.

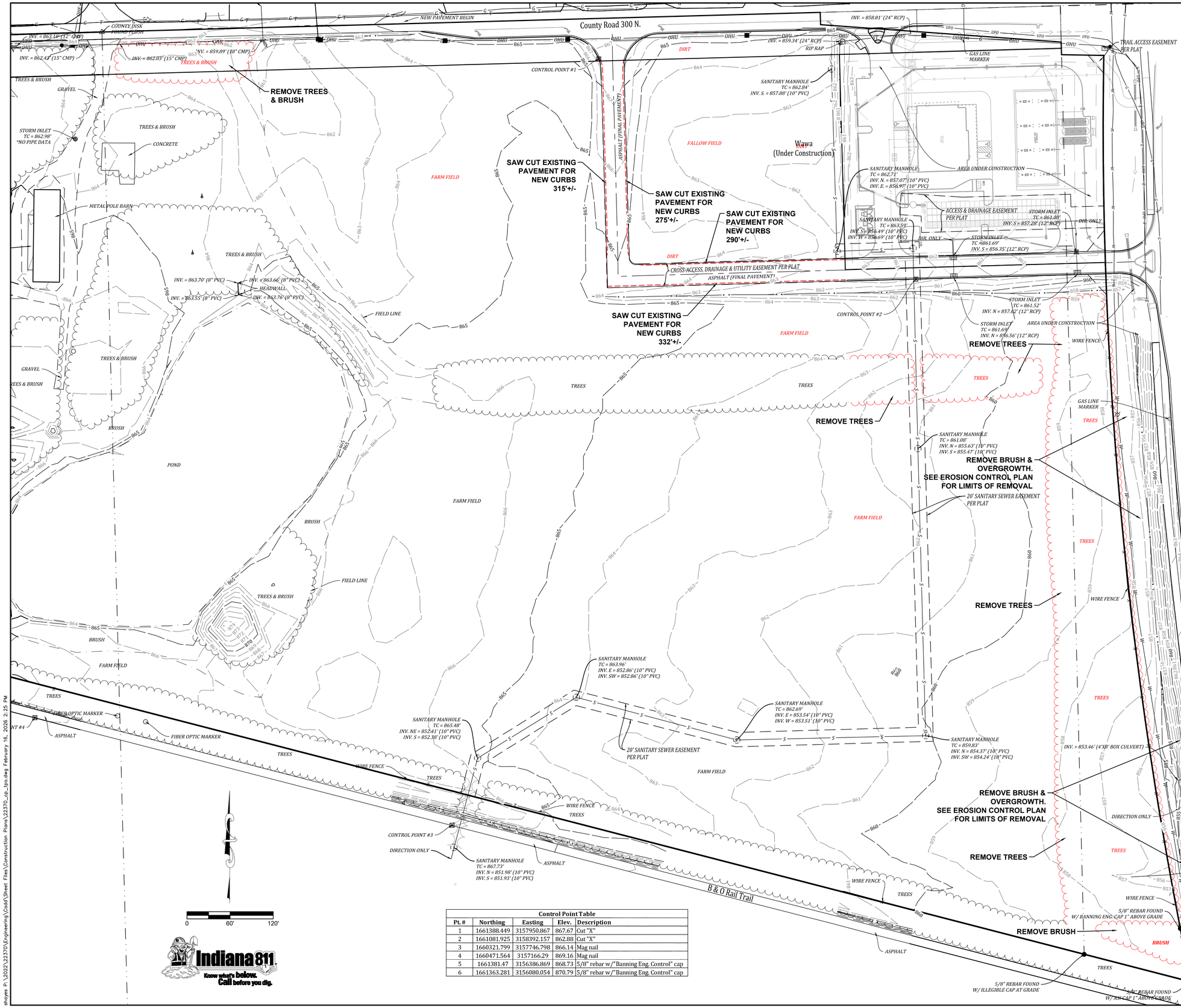
CHAD ZIEGLER
REGISTERED
No.
PE1200667
STATE OF
INDIANA
PROFESSIONAL ENGINEER

CERTIFIED BY: _____

Date: 01-23-2025
Project No: 22370
Sheet No: C100

RESERVE AT RONALD REAGAN INFRASTRUCTURE PHASE 1

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Control Point Table				
Pt. #	Northing	Easting	Elev.	Description
1	1661388.449	3157950.867	867.67	Cut "X"
2	1661081.925	3158392.157	862.88	Cut "X"
3	1660321.799	3157746.798	866.14	Mag nail
4	1660471.564	3157166.29	869.16	Mag nail
5	1661381.47	3156386.869	868.73	5/8" rebar w/"Banning Eng. Control" cap
6	1661363.281	3156080.054	870.79	5/8" rebar w/"Banning Eng. Control" cap

Indiana 811 Know what's below. Call before you dig.

Project Benchmark
The elevations shown hereon were derived from GPS observation using NAVD 88 Datum from the VRS (Virtual Reference Station) Control Network established by Seiler Company. The elevations were established for this network by continuously streaming data through fixed reference stations ((CORS)-Continuously Operating Reference Station) distributed throughout the network area to a central server running Trimble GPSNet and RTKNet software. Through previous survey work, the elevations derived from GPS observations are relatively accurate to published benchmarks (usually within +/-0.2 feet). Control point 1 was used as the benchmark and levels were ran through the temporary benchmarks shown below.
C.P. #1 Elev = 867.67' (NAVD 88)

Site Benchmark
TBM #120451 - per topographic survey by Kuhn and Gustafson Land Surveying dated 6-27-24
Southeast corner of right-of-way monument located on the north right-of-way line of East County Road 300 North about 500 feet west of Ronald Reagan Parkway.
Elev. = 866.57' (NAVD 88)

TBM #20
Cut square on top of concrete end section located about 2660 feet west of Ronald Reagan Parkway, 35 feet south of East County Road 300 North and 66 feet east of the east exit of Virgil Park.
Elev. = 869.92' (NAVD 88)

Notes:
Per 865 IAC 1-12-12 this drawing is not intended to be represented as a retracement or original boundary survey, a route survey, or a Surveyor Location Report.

The horizontal data shown on this exhibit is based upon standard radial survey techniques and by global positioning equipment, utilizing the VRS Network, a real-time kinematic (RTK) correction service over the internet. The coordinate values shown are in Indiana State Plane West Zone on the 1983 North American Datum.

All bearings, distances and coordinates are referenced to the Indiana State Plane West Zone (NAD 83) Coordinate System. The Combined Scale Factor for this project is 1.000000. Distances shown hereon are GRID distances (US survey feet).

The topographic information shown hereon is a combination of data obtained in the field by Banning Engineering during November 2025 and a topographic survey performed by Kuhn & Gustafson Land Surveying dated June 27, 2024 and spot checked by Banning Engineering while conducting the field work for this survey. The topographic data collected by Banning Engineering was gathered by using a robotic total station and data collector applying standard radial surveying techniques and by global positioning equipment, utilizing the VRS Network, a real-time kinematic (RTK) correction service over the internet.

Elevations on hard surfaces or structures are accurate to within 0.05 feet, elevations on natural surfaces are accurate to within 0.15 feet. The contours shown hereon were plotted based upon interpolation of spot elevations and other topographic information and are accurate to within one half of the contour interval.

This survey reflects above ground indications of utilities and information available from utility companies. The surveyor makes no guarantee that the underground utilities shown comprise all such utilities in the area, either in service or abandoned. The surveyor further does not warrant that the underground utilities shown are in the exact location indicated, although they are located as accurately as possible from the information available. The surveyor has not physically located the underground utilities.

Underground utilities shown per Indiana 811 ticket numbers 2511102390, 25111102453, 25111102490 and 2511102506 and private utility locates provided internally via Banning Engineering's Utilities Coordinator.

FLOOD STATEMENT
The surveyed property appears to be located in Zone "X" (areas determined to be outside the 0.2% annual chance floodplain) per the Flood Insurance Rate Map (FIRM) for Hendricks County, Indiana, community panel 18063C0186D, dated September 25, 2009, Federal Emergency Management Agency, National Flood Insurance Program. Per said FIRM, this parcel does not lie within the boundary of a Special Flood Hazard Area. The accuracy of any flood hazard statement is subject to map scale uncertainty.

LEGEND
EXISTING

- OHU — OVERHEAD UTILITIES
- OHE — OVERHEAD ELECTRIC LINE
- E — UNDERGROUND ELECTRIC LINE
- UFO — UNDERGROUND FIBER OPTIC LINE
- T — UNDERGROUND TELEPHONE LINE
- G — GAS LINE
- W — WATER LINE
- EDGE OF WATER
- FLOW LINE
- X — FENCE
- GUARDRAIL
- TREE LINE
- ST — STORM SEWER LINE
- S — SANITARY SEWER LINE
- STORM SEWER STRUCTURE
- SANITARY SEWER STRUCTURE
- FIRE HYDRANT
- GAS VALVE
- FIBER OPTIC BOX
- TELEPHONE SPLICE BOX
- UTILITY POLE
- GUY ANCHOR
- SIGN
- UTILITY VAULT
- WATER SPIGOT

Revisions

Sym.	Date

Designed: RRL/SJH
Drawn: SJH
Checked: RRL
Scale: 1"=60'
Date: 01-23-2025

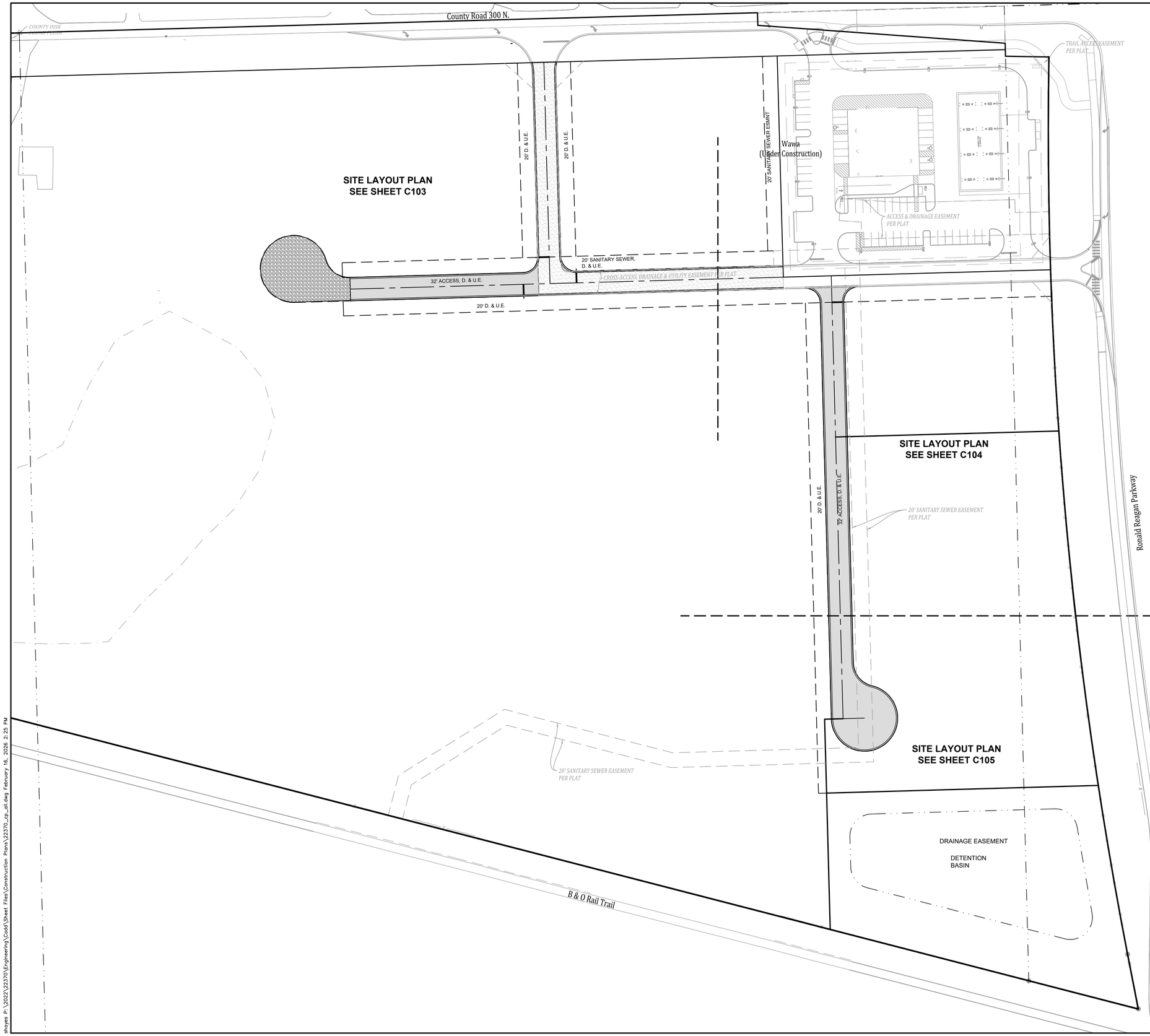
EXISTING TOPOGRAPHY & DEMO PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

W. CHAD ZIEGLER REGISTERED No. PE11200667 STATE OF INDIANA PROFESSIONAL ENGINEER
W. Chad Ziegler

BANNING ENGINEERING
853 COLUMBIA ROAD SUITE #101
PLAINFIELD, IN 46168
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E-MAIL: Banning@BanningEngineering.com
WEB: www.BanningEngineering.com

Project No: 22370
Sheet No: C101

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GENERAL NOTES

1. All work shall be performed in conformance with the Unified Development Ordinance for the Town of Brownsburg and all other ordinances which pertain to this type of work.
2. No changes in or departure from the plans or specifications shall be made without prior approval, in writing, by the Engineer.
3. The Contractor shall be responsible for obtaining all Federal, State, County and Town of Brownsburg permits, or any other permits required.
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9. Structural fill shall be compacted in maximum 6" lifts to 95% standard proctor.
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12. All accessible handicap pathways, sidewalks and drive crossings shall not exceed 5% running slope and 2% cross slope or the latest requirements of the Americans with Disabilities Act (ADA). Handicap ramps shall not exceed 1/12 slope and 2% cross slope or the latest requirements of the Americans with Disabilities Act (ADA).

LAND DESCRIPTION

Block A in The Reserve at Ronald Reagan, Lot 1 as per plat thereof recorded as Instrument Number 202521930 in the Office of the Recorder of Hendricks County, Indiana.

Part of the North Half of Fractional Section 30, Township 16 North, Range 2 East of the Second Principal in the Town of Avon, Hendricks County, Indiana, being Block A in The Reserve at Ronald Reagan, Lot 1 as per plat thereof recorded as Instrument Number 202521930 in the Office of the Recorder of said county and further described as follows:

Commencing at the northwest corner of the East Half of the Northwest Quarter of said Fractional Section 30, being the northwest corner of said The Reserve at Ronald Reagan, Lot 1; thence South 01 degree 29 minutes 34 seconds East along the west line of said The Reserve at Ronald Reagan, Lot 1 a distance of 59.29 feet to the POINT OF BEGINNING, said point being the northwest corner of Block A in said the Reserve at Ronald Reagan, Lot 1 (the remaining calls are along the northerly, easterly, southerly and westerly lines of said Block A); 1) thence North 88 degrees 23 minutes 17 seconds East 1,036.60 feet; 2) thence North 88 degrees 26 minutes 03 seconds East 1,025.00 feet; 3) thence South 01 degree 34 minutes 39 seconds East 299.62 feet; 4) thence North 88 degrees 24 minutes 50 seconds East 362.01 feet to the beginning of a non-tangent curve to the left having a radius of 5,856.30 feet, subtended by a long chord having a bearing of South 06 degrees 25 minutes 11 seconds East and a distance of 932.80 feet, with a central angle of 09 degrees 08 minutes 09 seconds, the radius point of which bears North 88 degrees 08 minutes 54 seconds East; 5) thence southerly along the arc of said curve 933.79 feet to a point which bears South 79 degrees 00 minutes 45 seconds West from said radius point; 6) thence South 11 degrees 00 minutes 18 seconds East 75.55 feet; 7) thence North 75 degrees 31 minutes 03 seconds West 2,617.75 feet; 8) thence North 01 degree 29 minutes 32 seconds West 578.97 feet to the POINT OF BEGINNING, containing 49.868 acres, more or less.

Indiana 811
Know what's below. Call before you dig.

Revisions	Sym.	Date

Designed: RRL, SJH
Drawn: SJH
Checked: RRL
Scale: 1"=60'
Date: 01-23-2025

OVERALL PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

W. CHAD ZIEGLER
REGISTERED
No.
PE11200667
STATE OF
INDIANA
PROFESSIONAL ENGINEER

BANNING ENGINEERING
653 COLUMBIA ROAD, SUITE #101
PLAINFIELD, IN 46168
BUS: (317) 707-3700, FAX: (317) 707-3800
E-MAIL: Banning@BanningEngineering.com
WEB: www.BanningEngineering.com

Project No: 22370
Sheet No: C102

Plotted: February 16, 2026 2:25 PM By: shoyes P:\2022\22370\Engineering\Cadd\Sheet Files\Construction Plans\22370_cp_ali.dwg

Indiana 811
Know what's below. Call before you dig.

0 30' 60'

County Road 300 N.

COUNTY DISK FOUND FLUSH

VISION CLEARANCE TRIANGLE PER PLAT

R49.5'

20' D. & U.E.

32' B/C-B/C

MATCH LINE, SEE SHEET C104

R20'

20' SANITARY SEWER, D. & U.E.

32' ACCESS, D. & U.E.

32' B/C-B/C

20' D. & U.E.

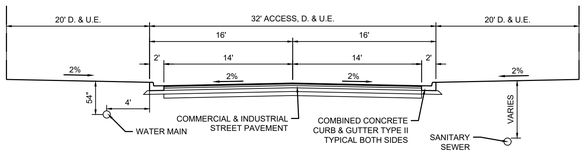
CROSS-ACCESS, DRAINAGE & UTILITY EASEMENT PER PLAT

GENERAL NOTES

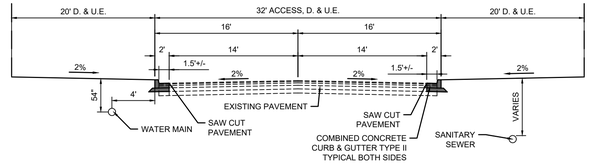
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SITE PLAN NOTES

- (A) COMMERCIAL STREET ASPHALT, SEE DETAIL 3/C501
- (B) CONCRETE CHAIR BACK CURB, SEE DETAIL 1/C501, 3/C501
- (C) CONCRETE GUTTER, SEE DETAIL 8/C501
- (D) EXISTING PAVEMENT
- (E) TEMPORARY GRAVEL CUL-DE-SAC, SEE DETAIL 5/C501
- (F) 2' WIDE, WHITE, THERMOPLASTIC STOP BAR
- (G) STOP SIGN, SEE DETAIL 7/C501
- (H) STREET SIGN, SEE DETAIL 10/C501
- (I) CONNECT TO EXISTING STREET, SEE DETAIL 4/C501



PRIVATE STREET SECTION A
NO SCALE



PRIVATE STREET SECTION B
NO SCALE

Revisions

Sym.	Date

Designed: RRL;SJH
Drawn: SJH
Checked: RRL
Scale: 1"=30'
Date: 01-23-2025

SITE LAYOUT PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

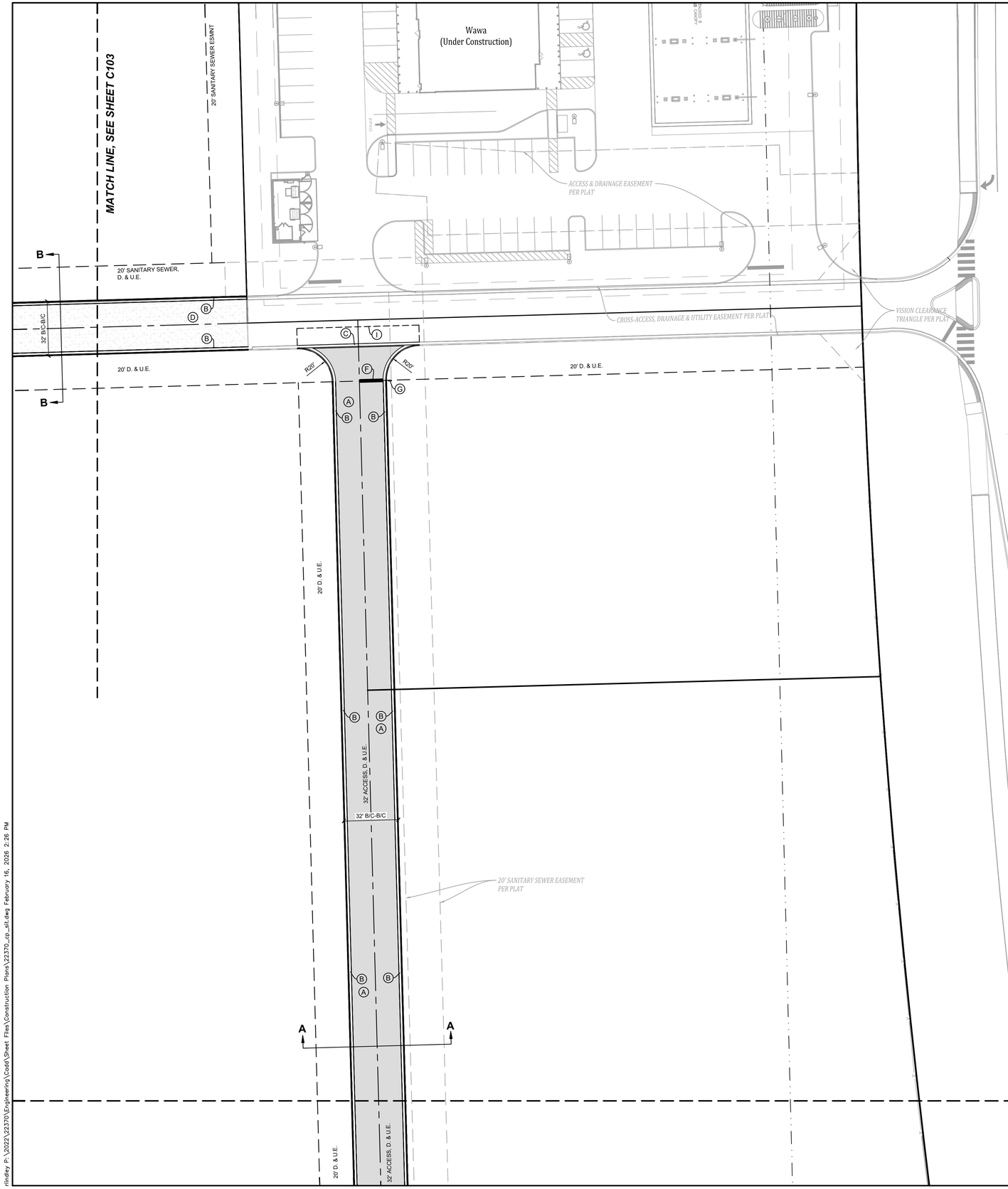
W. CHAD ZIEGLER REGISTERED No. PE11200667 STATE OF INDIANA PROFESSIONAL ENGINEER

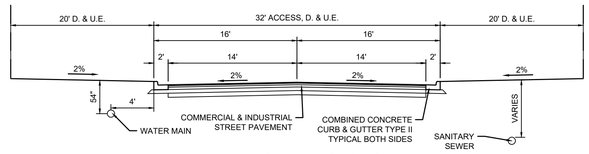
BANNING ENGINEERING
853 COLUMBIA ROAD, SUITE #101
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BUS: (317) 707-3700, FAX: (317) 707-3800
E-MAIL: Banning@BanningEngineering.com
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Project No: 22370

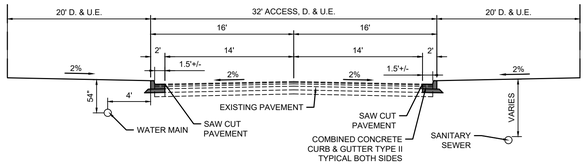
Sheet No: C103

Plotted by: rlindley P:\2022\22370\Engineering\Cadd\Sheet Files\Construction Plans\22370_cp_slt.dwg February 16, 2026 2:26 PM





PRIVATE STREET SECTION A
NO SCALE



PRIVATE STREET SECTION B
NO SCALE



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- (H) STREET SIGN, SEE DETAIL 4/C501
- (I) CONNECT TO EXISTING STREET, SEE DETAIL

Indiana 811 Know what's below. Call before you dig.

Revisions	Sym.	Date

Designed: RRL/SJH
Drawn: SJH
Checked: RRL
Scale: 1"=30'
Date: 01-23-2025

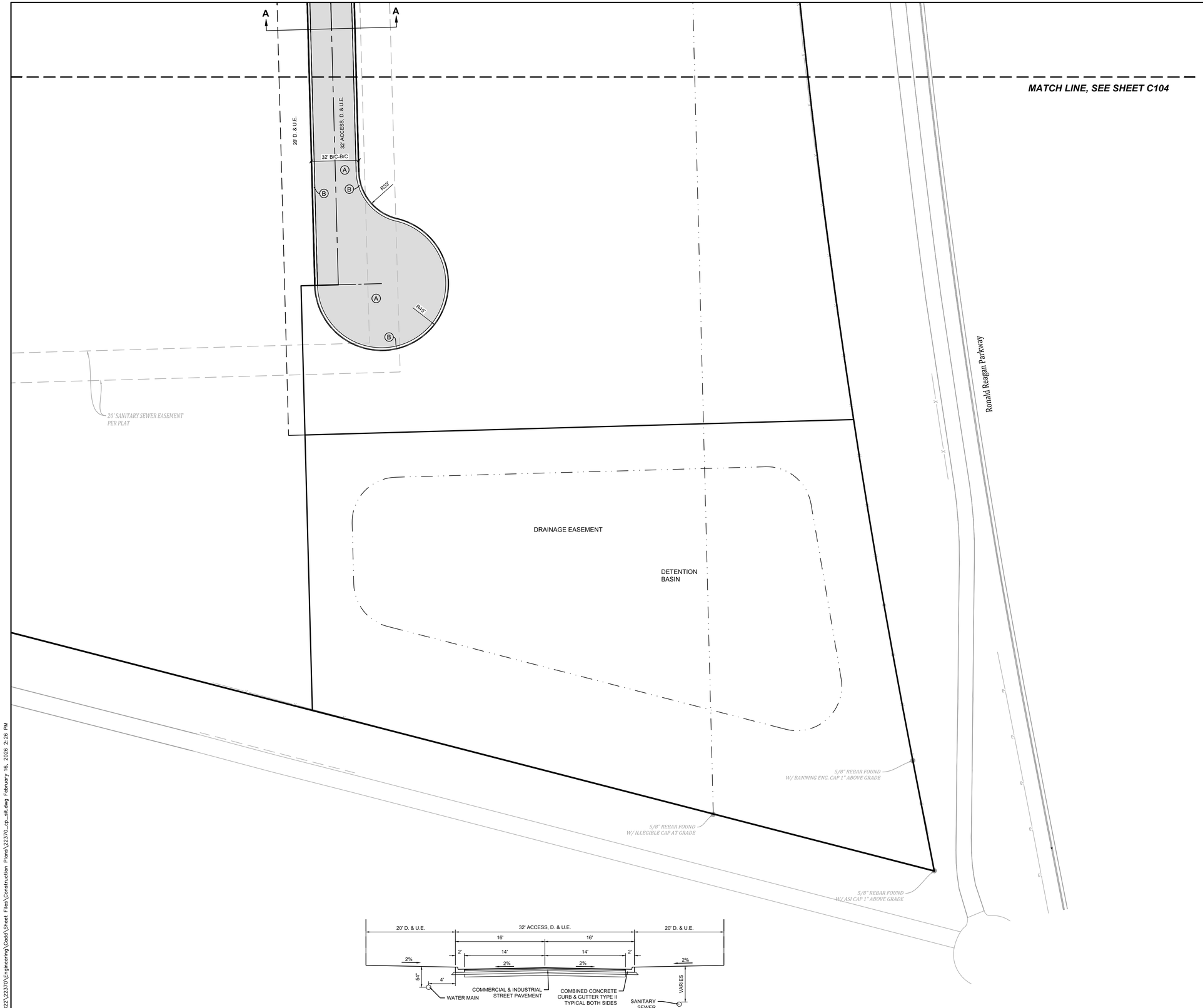
SITE LAYOUT PLAN
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W. CHAD ZIEGLER REGISTERED No. PE11200667 STATE OF INDIANA PROFESSIONAL ENGINEER

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Project No: 22370
Sheet No: C104

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PRIVATE STREET SECTION A

NO SCALE



GENERAL NOTES

1. All work shall be performed in conformance with the Unified Development Ordinance for the Town of Brownsburg and all other ordinances which pertain to this type of work.
2. No changes in or departure from the plans or specifications shall be made without prior approval, in writing, by the Engineer.
3. The Contractor shall be responsible for obtaining all Federal, State, County and Town of Brownsburg permits, or any other permits required.
4. Before construction begins, the Contractor shall field verify the location of all utilities shown on the plans, and contact all utility companies to locate all mains, conduits, service lines, etc., in the construction area, and shall protect all such utilities during construction.
5. Before construction begins, the Contractor shall notify the Owners, Owner's Engineer, and the Town of Brownsburg Development Services Office so that an inspector may be present.
6. It shall be the responsibility of the Contractor to maintain quality control throughout the project; failure to do so may result in removal and replacement of the defective work. It is recommended that the Owner have a qualified inspector on the job site at all times during construction.
7. The Engineer shall be notified of all field tile located on the site during construction. All such field tile shall be incorporated into the storm sewer system so that it remains in working condition.
8. Plans shall be bid as a working system. Any errors or omissions shall be brought to the attention of the Engineer prior to construction. In the event of the Contractor's failing to give such notice, they shall be held responsible for the results of any such errors or omissions, and the cost of rectifying the same.
9. Structural fill shall be compacted in maximum 6" lifts to 95% standard proctor.
10. Liability Insurance Policy shall be furnished to the Owner before any work is started.
11. The contractor shall notify the Town of Brownsburg at least 72 hours prior to any bonded or bank credit letter site improvements are installed. A pre-construction meeting shall be set up with the Town of Brownsburg, Contractor, engineer & owner prior to any construction.
12. All accessible handicap pathways, sidewalks and drive crossings shall not exceed 5% running slope and 2% cross slope or the latest requirements of the Americans with Disabilities Act (ADA). Handicap ramps shall not exceed 1/12 slope and 2% cross slope or the latest requirements of the Americans with Disabilities Act (ADA).

SITE PLAN NOTES

- (A) COMMERCIAL STREET ASPHALT, SEE DETAIL 9/C501
- (B) CONCRETE CHAIR BACK CURB, SEE DETAIL 1/C501, 3/C501
- (C) CONCRETE GUTTER, SEE DETAIL 8/C501
- (D) EXISTING PAVEMENT
- (E) TEMPORARY GRAVEL CUL-DE-SAC, SEE DETAIL 5/C501
- (F) 2' WIDE, WHITE, THERMOPLASTIC STOP BAR
- (G) STOP SIGN, SEE DETAIL 7/C501, 10/C501
- (H) STREET SIGN, SEE DETAIL
- (I) CONNECT TO EXISTING STREET, SEE DETAIL 4/C501

Revisions	Sym.	Date

Designed: RRL/SJH
Drawn: SJH
Checked: RRL
Scale: 1"=30'
Date: 01-23-2025

SITE LAYOUT PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

W. CHAD ZIEGLER REGISTERED No. PE11200667 STATE OF INDIANA PROFESSIONAL ENGINEER

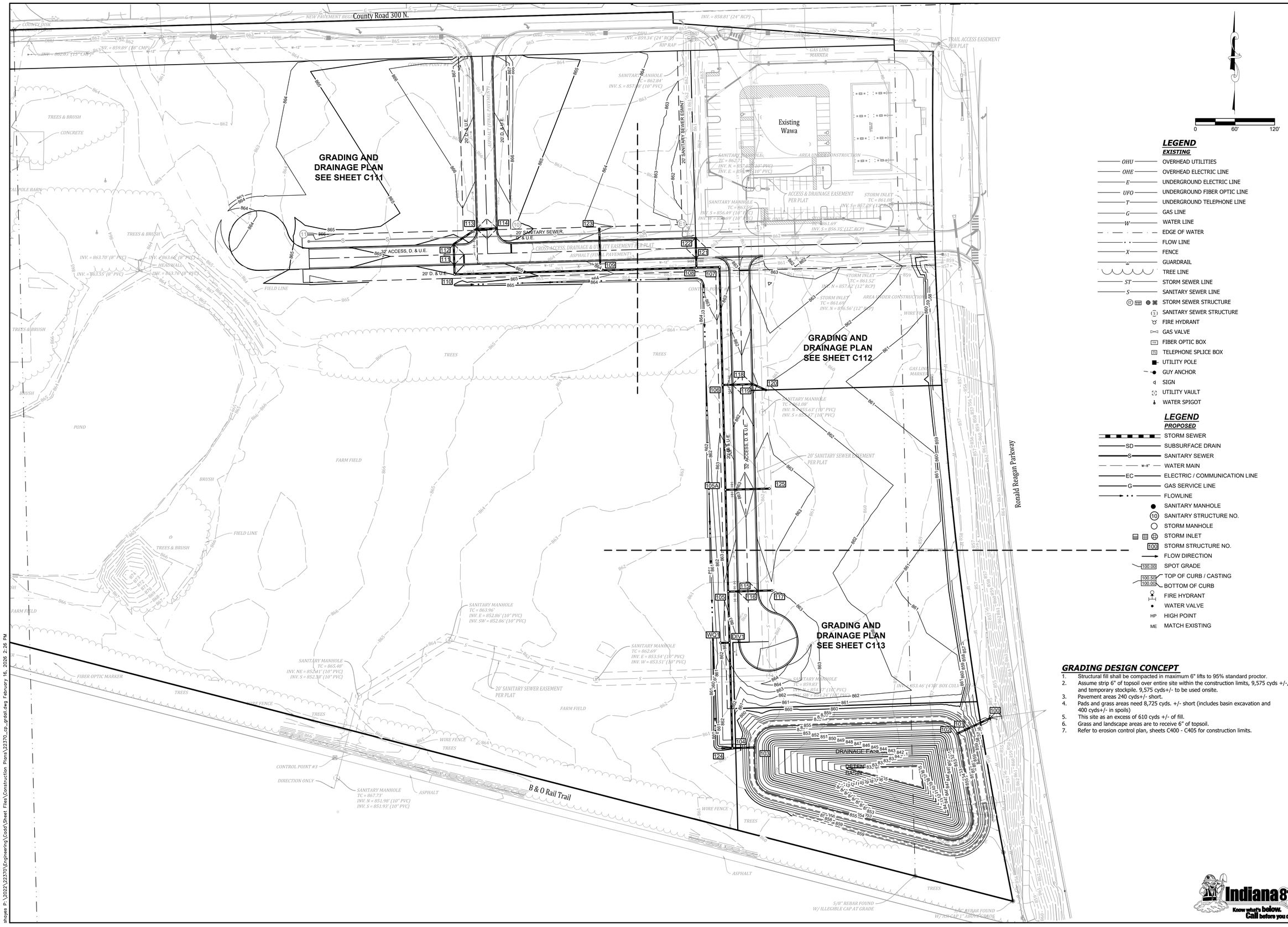
W. Chad Ziegler

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Indiana 811 Know what's below. Call before you dig.

Project No: 22370
Sheet No: C105

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LEGEND

EXISTING

- OHU — OVERHEAD UTILITIES
- OHE — OVERHEAD ELECTRIC LINE
- E — UNDERGROUND ELECTRIC LINE
- UFO — UNDERGROUND FIBER OPTIC LINE
- T — UNDERGROUND TELEPHONE LINE
- G — GAS LINE
- W — WATER LINE
- EDGE OF WATER
- FLOW LINE
- X — FENCE
- GUARDRAIL
- TREE LINE
- ST — STORM SEWER LINE
- S — SANITARY SEWER LINE
- STORM SEWER STRUCTURE
- SANITARY SEWER STRUCTURE
- FIRE HYDRANT
- GAS VALVE
- FIBER OPTIC BOX
- TELEPHONE SPLICE BOX
- UTILITY POLE
- GUY ANCHOR
- SIGN
- UTILITY VAULT
- WATER SPIGOT

LEGEND

PROPOSED

- STORM SEWER
- SD — SUBSURFACE DRAIN
- S — SANITARY SEWER
- W-8" — WATER MAIN
- EC — ELECTRIC / COMMUNICATION LINE
- G — GAS SERVICE LINE
- FLOWLINE
- SANITARY MANHOLE
- 10 — SANITARY STRUCTURE NO.
- STORM MANHOLE
- STORM INLET
- 100 — STORM STRUCTURE NO.
- FLOW DIRECTION
- 100.00 — SPOT GRADE
- 100.50 / 100.00 — TOP OF CURB / CASTING / BOTTOM OF CURB
- FIRE HYDRANT
- WATER VALVE
- HP — HIGH POINT
- ME — MATCH EXISTING

GRADING DESIGN CONCEPT

1. Structural fill shall be compacted in maximum 6" lifts to 95% standard proctor.
2. Assume strip 6" of topsoil over entire site within the construction limits, 9,575 cyds +/-, and temporary stockpile. 9,575 cyds+/- to be used onsite.
3. Pavement areas 240 cyds+/- short.
4. Pads and grass areas need 8,725 cyds. +/- short (includes basin excavation and 400 cyds+/- in spoils)
5. This site as an excess of 610 cyds +/- of fill.
6. Grass and landscape areas are to receive 6" of topsoil.
7. Refer to erosion control plan, sheets C400 - C405 for construction limits.

Indiana 811 — Know what's below. Call before you dig.

Revisions	Sym.	Date

Designed: RRL/SJH
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Checked: RRL
Scale: 1"=60'
Date: 01-23-2025

OVERALL GRADING PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

W. CHAD ZIEGLER — REGISTERED No. PE11200667 STATE OF INDIANA — PROFESSIONAL ENGINEER

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Project No: 22370

Sheet No: C110

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Indiana 811
Know what's below. Call before you dig.

0 30' 60'

County Road 300 N.

INV. = 859.34' (18" CMP)

INV. = 862.03' (15" CMP)

INV. = 859.89' (18" CMP)

COUNTY DISK FOUND FLUSH

NEW PAVEMENT BEGIN

TREES & BRUSH

VISION CLEARANCE TRIANGLE PER PLAT

CONTROL POINT 4

BUILDING PAD

20' D. & U.E.

ASPHALT (FINAL PAVEMENT)

20 LF +/- OF 4" SUB-DRAIN FINGERS TYP. WHERE SHOWN SEE DETAIL 9 C501

20' SANITARY SEWER, D. & U.E.

32' ACCESS, D. & U.E.

CROSS-ACCESS, DRAINAGE & UTILITY EASEMENT PER PLAT

FIELD LINE

TREES

MATCH LINE, SEE SHEET C112

LEGEND
EXISTING

- OHU — OVERHEAD UTILITIES
- OHE — OVERHEAD ELECTRIC LINE
- E — UNDERGROUND ELECTRIC LINE
- UFO — UNDERGROUND FIBER OPTIC LINE
- T — UNDERGROUND TELEPHONE LINE
- G — GAS LINE
- W — WATER LINE
- EDGE OF WATER
- FLOW LINE
- X — FENCE
- GUARDRAIL
- TREE LINE
- ST — STORM SEWER LINE
- S — SANITARY SEWER LINE
- STORM SEWER STRUCTURE
- SANITARY SEWER STRUCTURE
- FIRE HYDRANT
- GAS VALVE
- FIBER OPTIC BOX
- TELEPHONE SPLICE BOX
- UTILITY POLE
- GUY ANCHOR
- SIGN
- UTILITY VAULT
- WATER SPIGOT

LEGEND
PROPOSED

- STORM SEWER
- SD — SUBSURFACE DRAIN
- S — SANITARY SEWER
- WATER MAIN
- EC — ELECTRIC / COMMUNICATION LINE
- G — GAS SERVICE LINE
- FLOWLINE
- SANITARY MANHOLE
- (10) SANITARY STRUCTURE NO.
- STORM MANHOLE
- STORM INLET
- 100 STORM STRUCTURE NO.
- FLOW DIRECTION
- 100.00 SPOT GRADE
- 100.50 / 100.00 TOP OF CURB / CASTING, BOTTOM OF CURB
- FIRE HYDRANT
- WATER VALVE
- HP HIGH POINT
- ME MATCH EXISTING

Revisions

Sym.	Date

Designed: RRL/SJH
Drawn: SJH
Checked: RRL
Scale: 1"=30'
Date: 01-23-2025

GRADING AND DRAINAGE PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

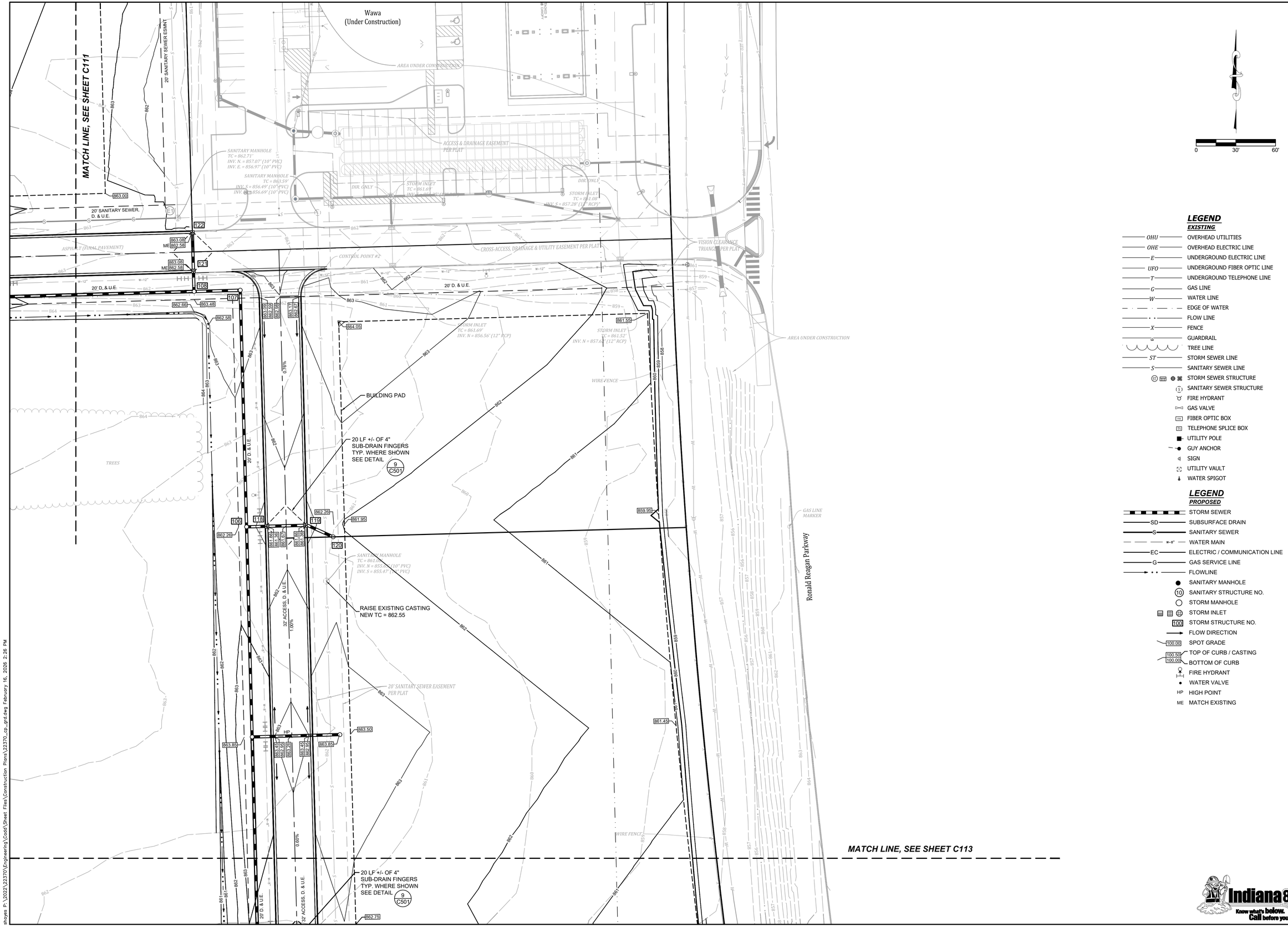
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Project No: 22370

Sheet No: C111

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LEGEND
EXISTING

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- TELEPHONE SPLICE BOX
- UTILITY POLE
- GUY ANCHOR
- SIGN
- UTILITY VAULT
- WATER SPIGOT

LEGEND
PROPOSED

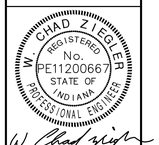
- STORM SEWER
- SD — SUBSURFACE DRAIN
- S — SANITARY SEWER
- w-8" — WATER MAIN
- EC — ELECTRIC / COMMUNICATION LINE
- G — GAS SERVICE LINE
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- 10 — SANITARY STRUCTURE NO.
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- 100.00 — SPOT GRADE
- 100.50 / 100.00 — TOP OF CURB / CASTING / BOTTOM OF CURB
- FIRE HYDRANT
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- HP — HIGH POINT
- ME — MATCH EXISTING

Revisions

Sym.	Date

Designed: RRL, SJH
Drawn: SJH
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GRADING AND DRAINAGE PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA



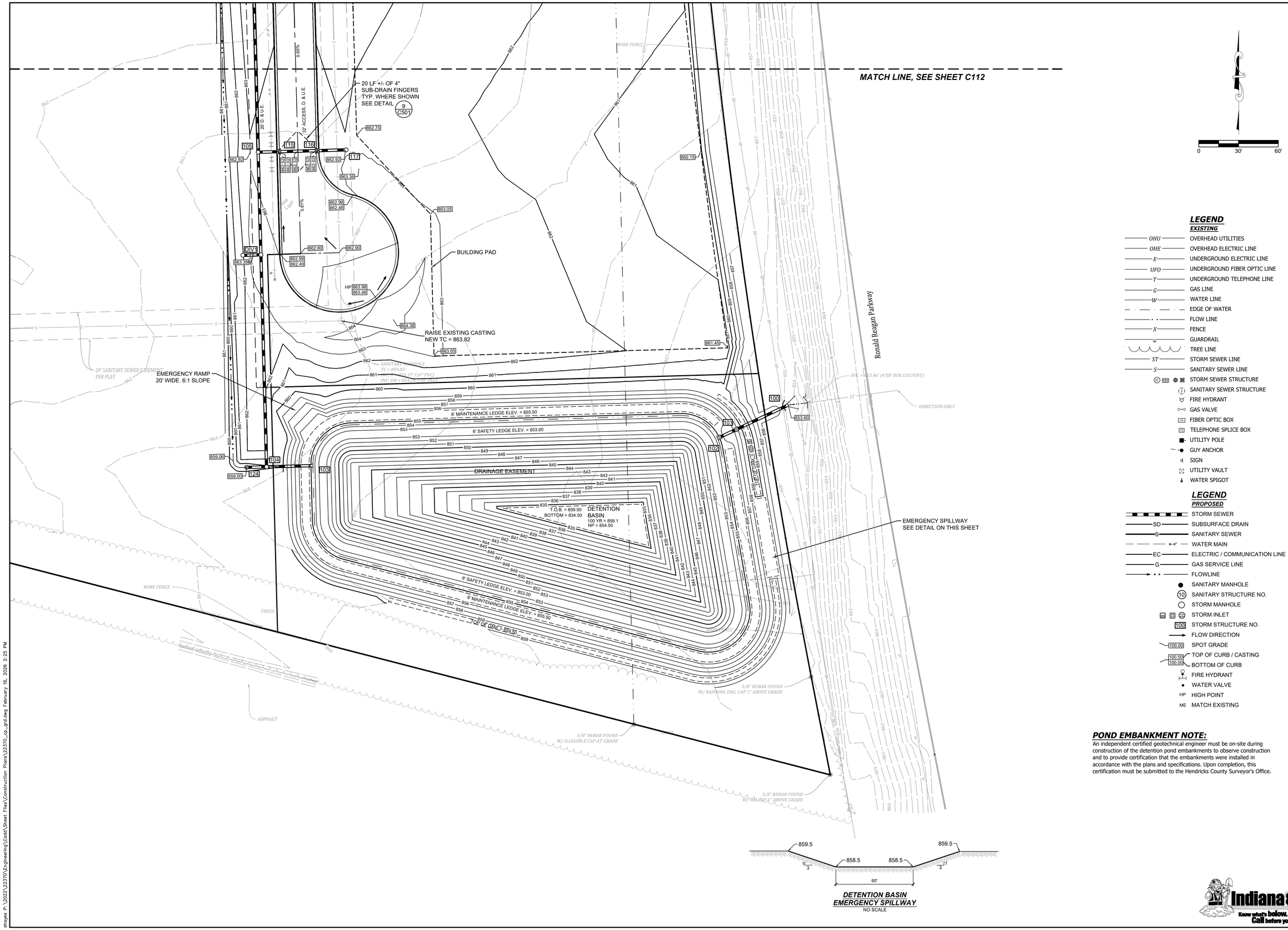
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Project No: 22370

Sheet No: C112

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DETENTION BASIN EMERGENCY SPILLWAY
NO SCALE

LEGEND
EXISTING

- OHU — OVERHEAD UTILITIES
- OHE — OVERHEAD ELECTRIC LINE
- E — UNDERGROUND ELECTRIC LINE
- UFO — UNDERGROUND FIBER OPTIC LINE
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- GUY ANCHOR
- SIGN
- UTILITY VAULT
- WATER SPIGOT

LEGEND
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- FIRE HYDRANT
- WATER VALVE
- HP — HIGH POINT
- ME — MATCH EXISTING

POND EMBANKMENT NOTE:
An independent certified geotechnical engineer must be on-site during construction of the detention pond embankments to observe construction and to provide certification that the embankments were installed in accordance with the plans and specifications. Upon completion, this certification must be submitted to the Hendricks County Surveyor's Office.

Revisions

Sym.	Date

Designed: RRL, SJH
Drawn: SJH
Checked: RRL
Scale: 1"=30'
Date: 01-23-2025

GRADING AND DRAINAGE PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

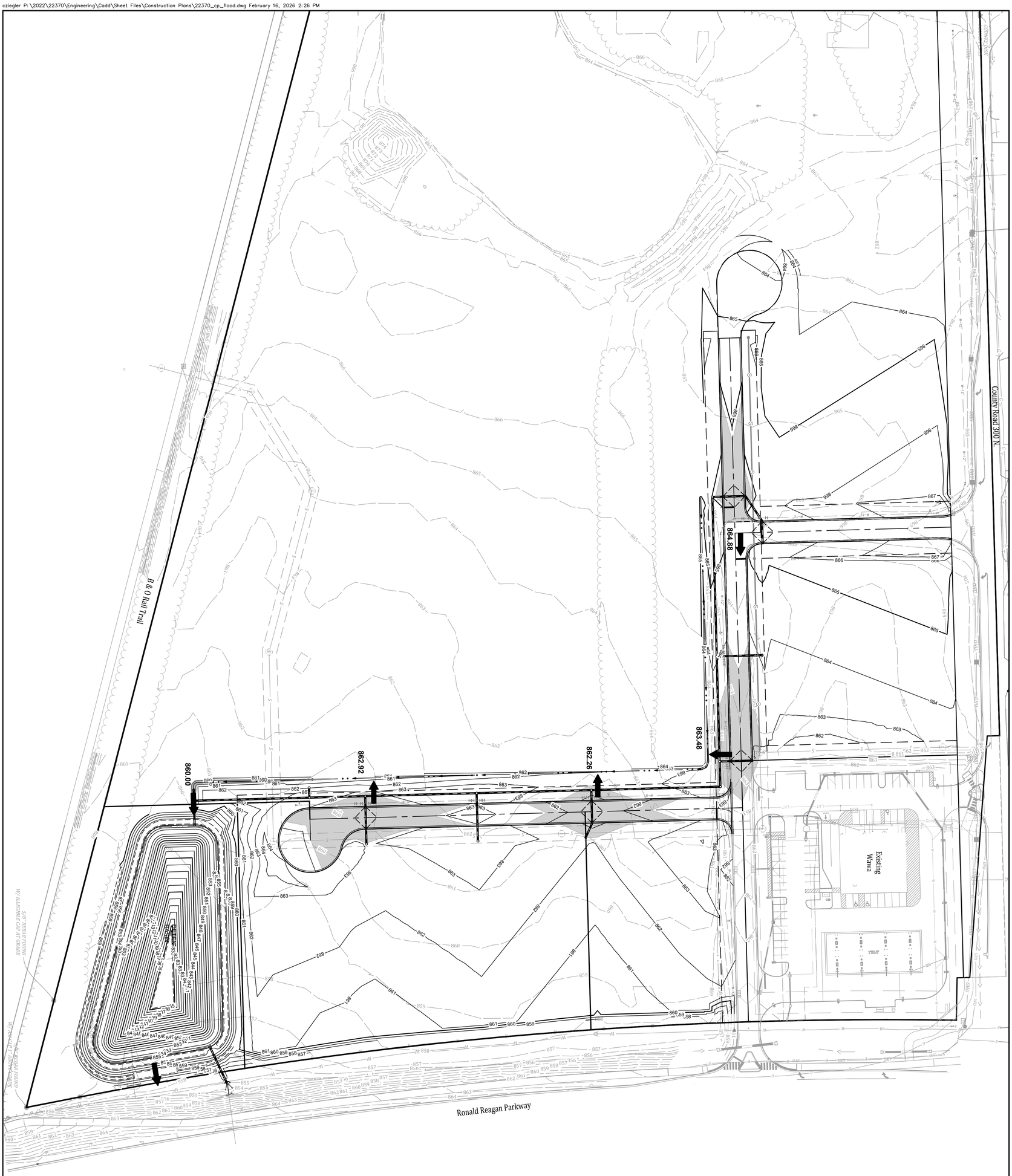
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Project No: 22370
Sheet No: C113

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LEGEND

837.0 FLOOD ELEVATION

FLOOD ROUTE

0 60' 120'

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W. CHAD ZIGLER REGISTERED PROFESSIONAL ENGINEER STATE OF INDIANA PE11200667

FLOOD ROUTING PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

Designed:	Sym.	Revisions	Date
RRL/SJH			
Drawn: SJH			
Checked: RRL			
Scale: 1"=60'			
Date: 01-23-2025			

Project No: 22370

Sheet No: C114

County Road 300 N.

COUNTY DISK
COUNTY FLOW

INV. = 859.89' (18" CMP)

INV. = 862.63' (15" RCP)

INV. = 858.91' (24" RCP)

INV. = 859.34' (24" RCP)

TRAIL ACCESS EASEMENT PER PLAT

SANITARY MANHOLE
TC = 862.84'
INV. S = 857.88' (10" PVC)

20' D. & U.E.

20' SANITARY SEWER ESMNT.

Wawa
(Under Construction)

SANITARY MANHOLE
TC = 862.71'
INV. N = 857.03' (10" PVC)
INV. E = 851.71' (10" PVC)

ACCESS & DRAINAGE EASEMENT PER PLAT

STORM INLET
TC = 861.08'

SANITARY MANHOLE
TC = 863.59'
INV. W = 853.49' (10" PVC)
INV. E = 853.69' (10" PVC)

STORM MANHOLE
TC = 861.69'
INV. S = 856.35' (12" RCP)

20' SANITARY SEWER
D. & U.E.

32' ACCESS, D. & U.E.

CROSS-ACCESS, DRAINAGE & UTILITY EASEMENT PER PLAT

20' D. & U.E.

INV. = 863.70' (8" PVC)
INV. = 863.66' (8" PVC)
INV. = 863.55' (8" PVC)
INV. = 863.76' (8" PVC)

STORM INLET
TC = 861.52'
INV. N = 857.62' (12" RCP)

STORM INLET
TC = 861.69'
INV. N = 856.56' (12" RCP)

Ronald Reagan Parkway

SANITARY MANHOLE
TC = 861.08'
INV. N = 855.63' (10" PVC)
INV. S = 855.47' (10" PVC)

20' SANITARY SEWER EASEMENT PER PLAT

32' ACCESS, D. & U.E.

20' D. & U.E.

105A

125

105

115

116

117

WQ1

DIV1

SANITARY MANHOLE
TC = 863.96'
INV. E = 852.86' (10" PVC)
INV. SW = 852.86' (10" PVC)

SANITARY MANHOLE
TC = 865.48'
INV. NE = 852.41' (10" PVC)
INV. S = 852.38' (10" PVC)

SANITARY MANHOLE
TC = 862.69'
INV. E = 853.54' (10" PVC)
INV. W = 853.51' (10" PVC)

20' SANITARY SEWER EASEMENT PER PLAT

SANITARY MANHOLE
TC = 859.83'
INV. N = 854.37' (10" PVC)
INV. SW = 854.24' (10" PVC)

INV. = 853.46' (4'X8' BOX CULVERT)

100

101

102

124

104

103

DRAINAGE EASEMENT

DETENTION
BASIN

DIRECTION ONLY

DIRECTION ONLY

SANITARY MANHOLE
TC = 867.73'
INV. N = 851.98' (10" PVC)
INV. S = 851.93' (10" PVC)

B & O Rail Trail

5/8" REBAR FOUND
W/ BANNING ENG. CAP 1" ABOVE GRADE

5/8" REBAR FOUND
W/ ILLEGIBLE CAP AT GRADE

5/8" REBAR FOUND
W/ ASH CAP 1" ABOVE GRADE

0 60' 120'

LEGEND
EXISTING

- OHU — OVERHEAD UTILITIES
- OHE — OVERHEAD ELECTRIC LINE
- E — UNDERGROUND ELECTRIC LINE
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- GUARDRAIL
- ST — STORM SEWER LINE
- S — SANITARY SEWER LINE
- STORM SEWER STRUCTURE
- SANITARY SEWER STRUCTURE
- FIRE HYDRANT
- GAS VALVE
- FIBER OPTIC BOX
- TELEPHONE SPLICE BOX
- UTILITY POLE
- GUY ANCHOR
- SIGN
- UTILITY VAULT
- WATER SPIGOT

LEGEND
PROPOSED

- STORM SEWER
- SD — SUBSURFACE DRAIN
- S — SANITARY SEWER
- 8" W — WATER MAIN
- EC — ELECTRIC / COMMUNICATION LINE
- G — GAS SERVICE LINE
- FLOWLINE
- SANITARY MANHOLE
- 10 — SANITARY STRUCTURE NO.
- STORM MANHOLE
- STORM INLET
- 100 — STORM STRUCTURE NO.
- FIRE HYDRANT
- WATER VALVE

Revisions | Sym. | Date

Designed: RRL/SJH
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Scale: 1"=60'
Date: 01-23-2025

OVERALL UTILITY PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

W. CHAD ZIGLER
REGISTERED
No. PE11200667
STATE OF INDIANA
PROFESSIONAL ENGINEER

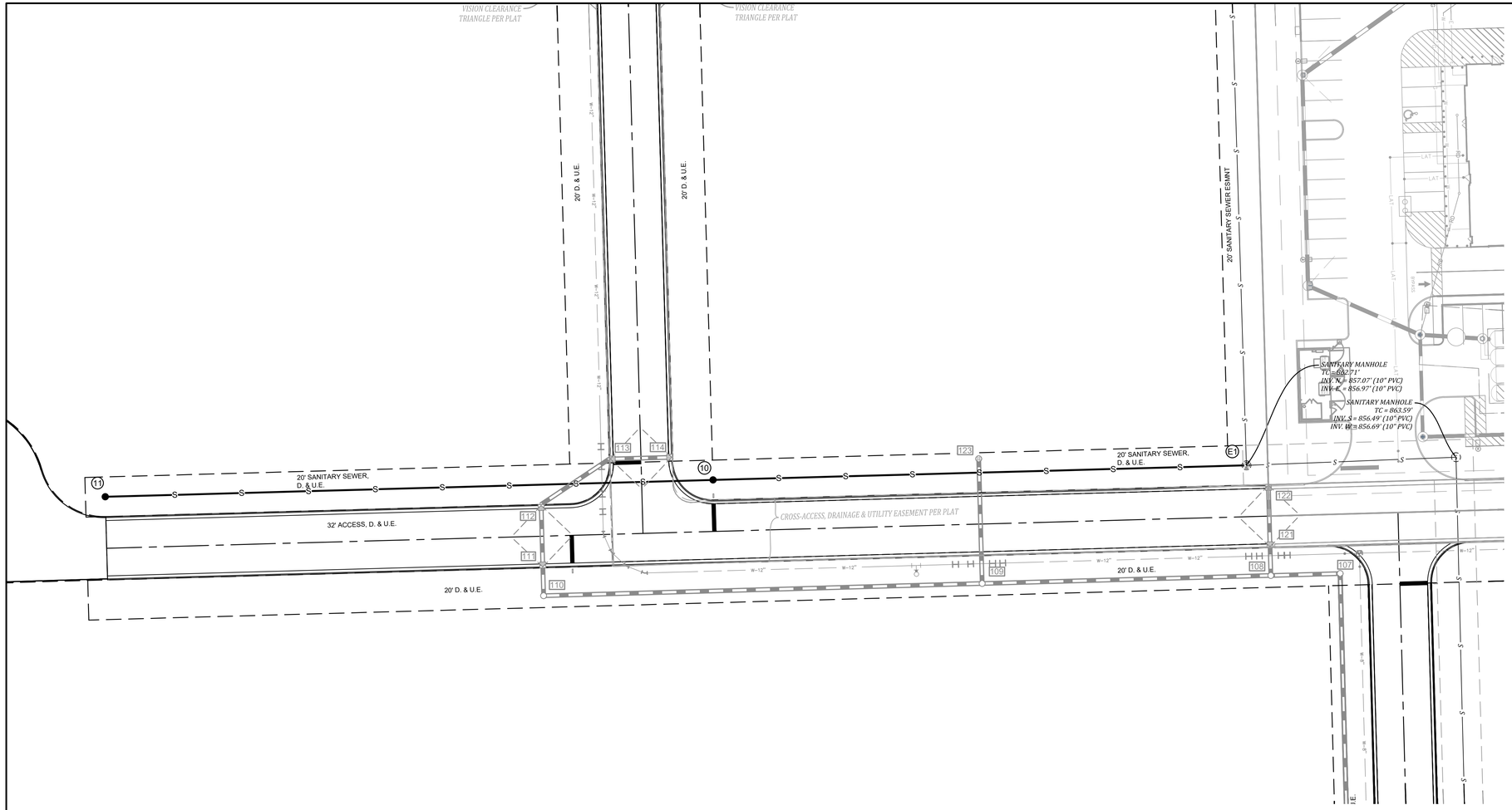
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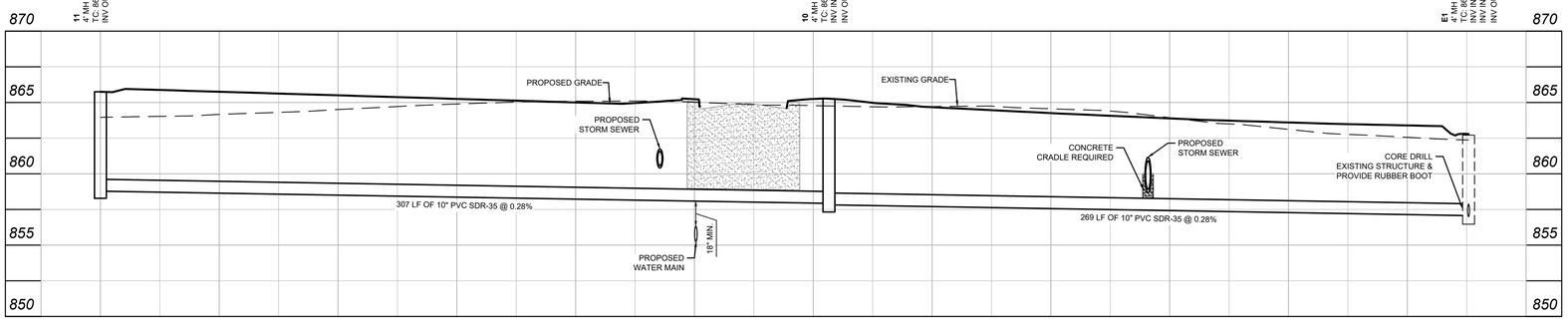
Indiana 811
Know what's below. Call before you dig.

Project No: 22370

Sheet No: C300

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SANITARY STRS 11-E1

LEGEND
EXISTING

- OHU — OVERHEAD UTILITIES
- OHE — OVERHEAD ELECTRIC LINE
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- ST — STORM SEWER STRUCTURE
- S — SANITARY SEWER STRUCTURE
- FIRE HYDRANT
- GAS VALVE
- FIBER OPTIC BOX
- TELEPHONE SPLICE BOX
- UTILITY POLE
- GUY ANCHOR
- SIGN
- UTILITY VAULT
- WATER SPIGOT

LEGEND
PROPOSED

- STORM SEWER
- SD — SUBSURFACE DRAIN
- S — SANITARY SEWER
- W-8" — WATER MAIN
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- 10 — SANITARY STRUCTURE NO.
- STORM MANHOLE
- STORM INLET
- 100 — STORM STRUCTURE NO.
- FIRE HYDRANT
- WATER VALVE
- FIRE DEPARTMENT CONNECTION

SANITARY SEWER PLAN GENERAL NOTES

1. All sewers, manholes and castings shall be per Hendricks County Regional Sewer District Specifications.
2. It shall be the contractors responsibility to field verify all utility locations before any construction begins.
3. All construction activity on this site are to be performed in compliance with OSHA standards.
4. There is to be a minimum of 10 feet horizontal separation and 18 inches vertical separation between the sanitary sewer and the water line.
5. Any sanitary sewer and storm sewer crossings with less than 2 feet of vertical separation shall be concrete encased.
6. All sanitary sewer mains 15 feet and deeper use SDR 26 pipe. All other sanitary sewer mains use SDR 35 pipe.
7. Sanitary Laterals shall SDR 26 pipe with a minimum slope of 1/4" per foot.
8. Laterals shown are approximate, final location and connection to buildings to be determined by the Developer.
9. Tracer wire placed on top of lateral from the building to the downstream connection point.
10. Cleanouts located under concrete and asphalt pavement shall be heavy duty and be able to withstand traffic loads.

GRANULAR BACKFILL
HENDRICKS COUNTY
SEWER DISTRICT
STANDARDS

Indiana 811
Know what's below. Call before you dig.

Designed: RRL/SJH
Drawn: SJH
Checked: RRL
Scale: 1"= XX'
Date: 01-23-2025

Sym.	Revisions	Date

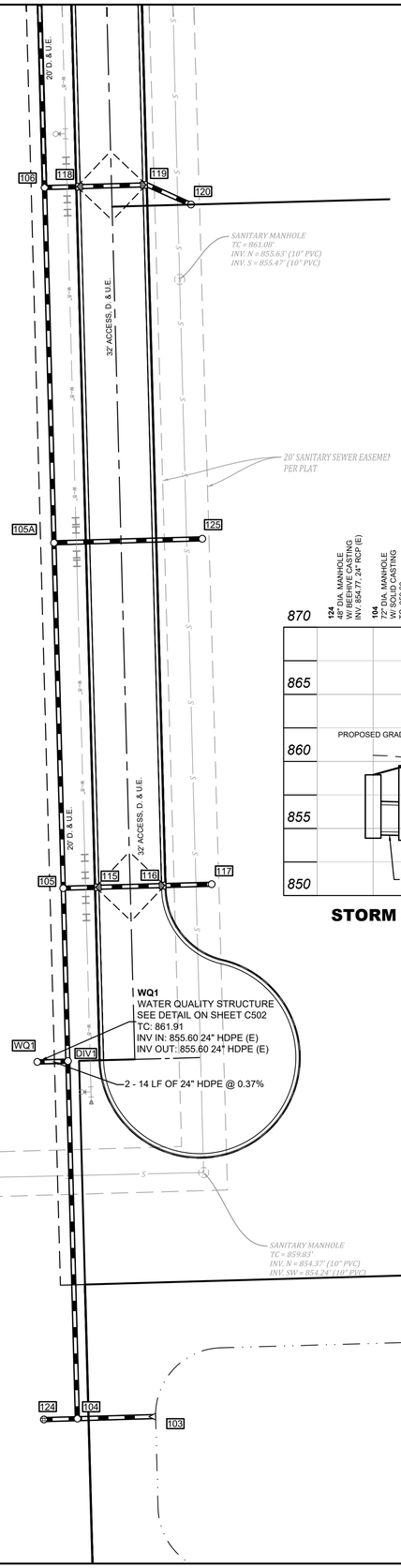
SANITARY PLAN AND PROFILE
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

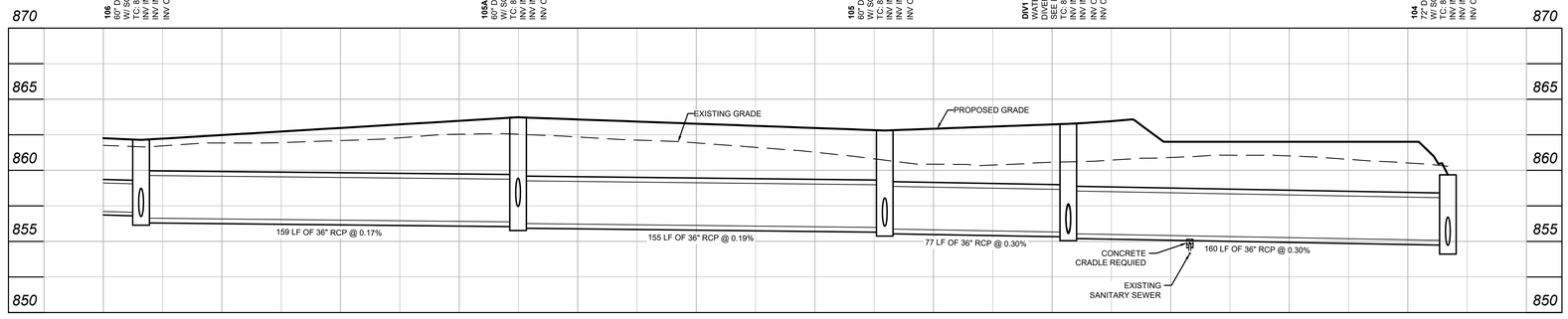
W. CHAD ZIEGLER
REGISTERED
No. PE11200667
STATE OF INDIANA
PROFESSIONAL ENGINEER

BANNING ENGINEERING
853 COLUMBIA ROAD SUITE #101
PLAINFIELD, IN 46168
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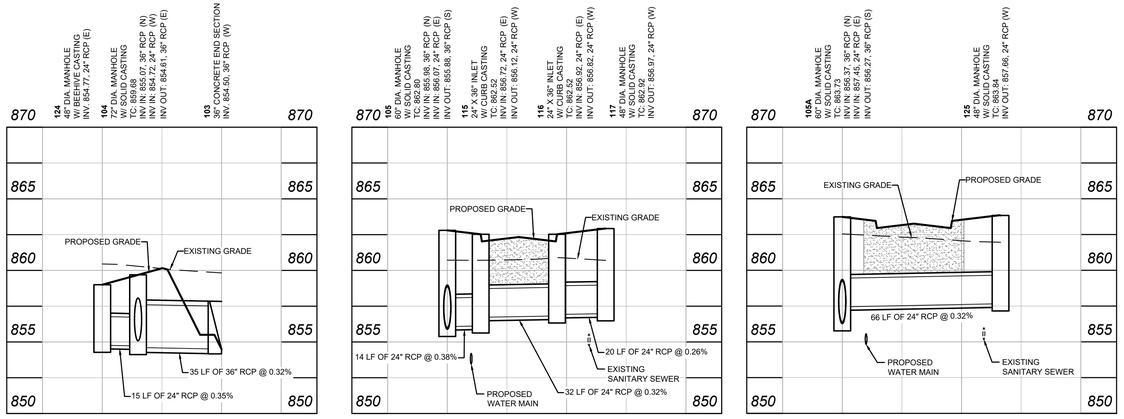
Project No: 22370
Sheet No: C310

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STORM STRS 106-104



STORM STRS 124-103

STORM STRS 105-117

STORM STRS 105A-125

STORM SEWER GENERAL NOTES

1. All storm sewer construction shall be per Town of Brownsburg details and specifications.
2. It shall be the Contractor's responsibility to field verify all utility locations before construction begins.
3. All construction activity on this site to be performed in compliance with applicable O.S.H.A. standards.
4. Contractor shall verify the the elevation of existing inverts prior to construction and notify the Engineer if the storm sewer cannot be constructed as planned.
5. All Castings shall meet Town of Brownsburg Standards, unless noted in otherwise the profile view.
   Beehive Casting = 'Neenah' R-2510-A
   Curb Casting = 'Neenah' R-3287-10V
   Solid Casting = 'Neenah' R-1642
6. All inlet castings shall be pre-stamped with "DUMP NO WASTE, (fish icon) DRAINS TO WATERWAY", minimum 1" high letters.
7. There shall be a minimum of 10 feet horizontal separation and 18 inches vertical separation between the sanitary sewer and water lines.

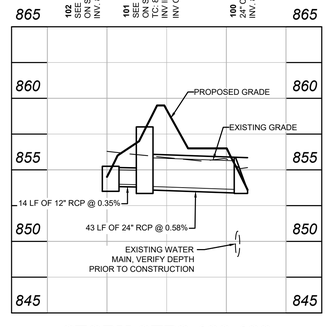
LEGEND

EXISTING

- OHU — OVERHEAD UTILITIES
- OHE — OVERHEAD ELECTRIC LINE
- E — UNDERGROUND ELECTRIC LINE
- UFO — UNDERGROUND FIBER OPTIC LINE
- T — UNDERGROUND TELEPHONE LINE
- G — GAS LINE
- W — WATER LINE
- EDGE OF WATER
- FLOW LINE
- X — FENCE
- GUARDRAIL
- ST — STORM SEWER LINE
- S — SANITARY SEWER LINE
- STORM SEWER STRUCTURE
- SANITARY SEWER STRUCTURE
- FIRE HYDRANT
- GAS VALVE
- FIBER OPTIC BOX
- TELEPHONE SPLICE BOX
- UTILITY POLE
- GUY ANCHOR
- SIGN
- UTILITY VAULT
- WATER SPIGOT

PROPOSED

- STORM SEWER
- SD — SUBSURFACE DRAIN
- S — SANITARY SEWER
- W — WATER MAIN
- EC — ELECTRIC / COMMUNICATION LINE
- G — GAS SERVICE LINE
- FLOWLINE
- SANITARY MANHOLE
- 10 — SANITARY STRUCTURE NO.
- STORM MANHOLE
- STORM INLET
- 100 — STORM STRUCTURE NO.
- FIRE HYDRANT
- WATER VALVE
- FIRE DEPARTMENT CONNECTION



STORM STRS 102-100

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WEB: www.BanningEngineering.com

W. CHAD ZIEGLER — REGISTERED No. PE11200667 STATE OF INDIANA — PROFESSIONAL ENGINEER

Indiana 811 — Know what's below. Call before you dig.

Revisions

Sym.	Date

Designed: RRL;SJH
Drawn: SJH
Checked: RRL
Scale: 1"=30'
Date: 01-23-2025

STORM SEWER PLAN AND PROFILES
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

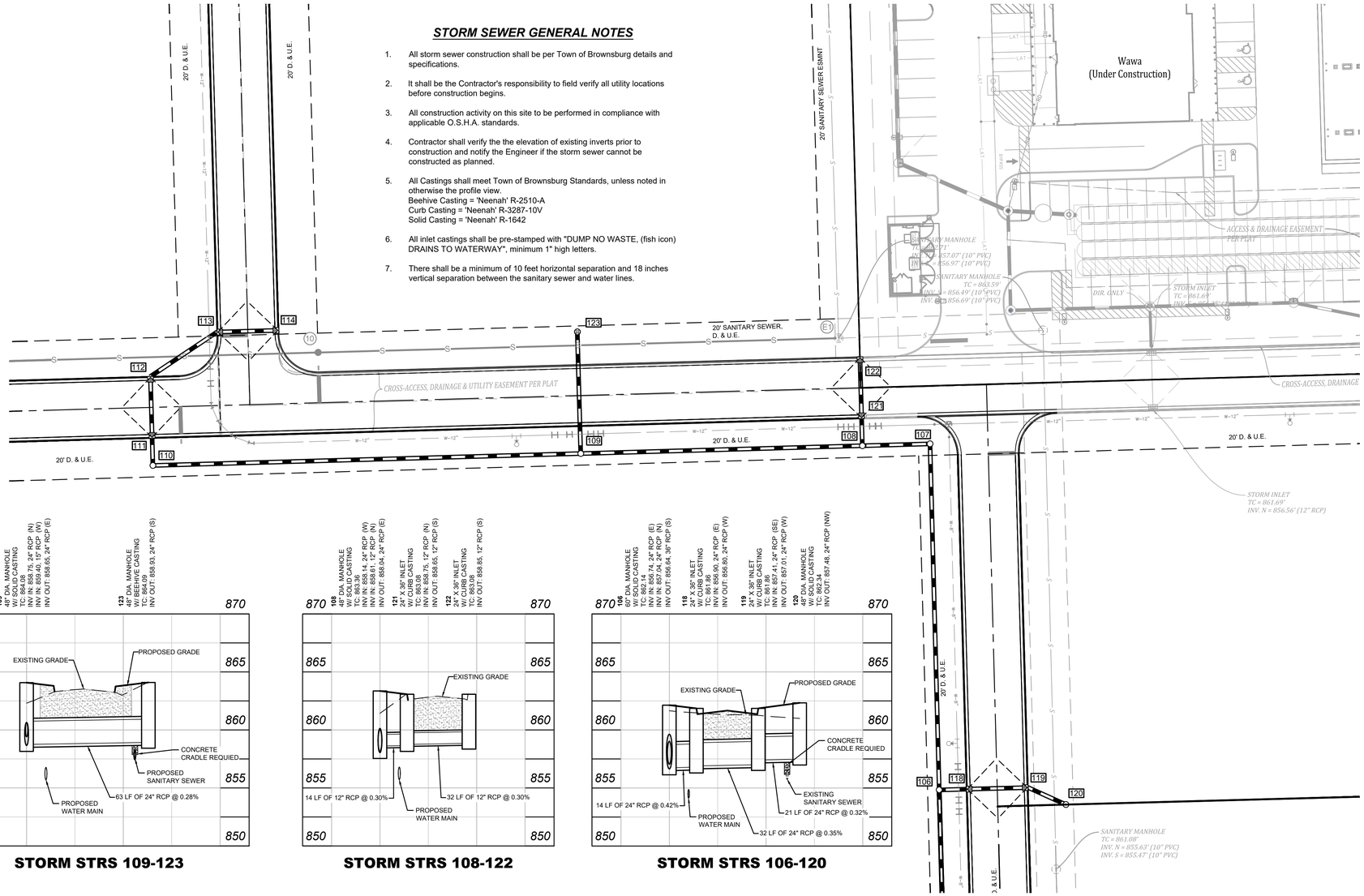
Project No: 22370

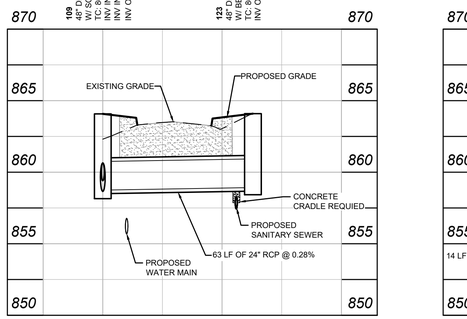
Sheet No: C320

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STORM SEWER GENERAL NOTES

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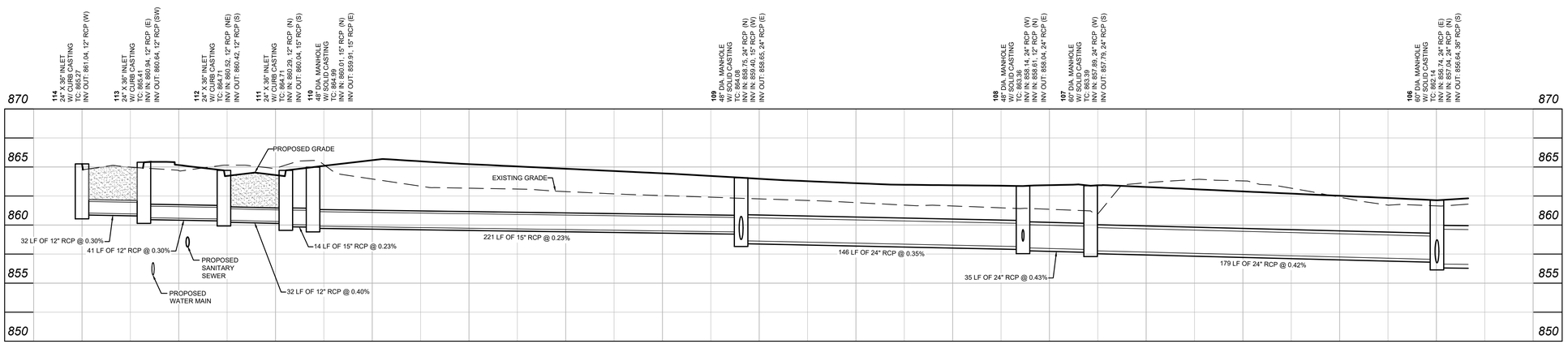




STORM STRS 109-123

STORM STRS 108-122

STORM STRS 106-120



STORM STRS 114-106

LEGEND

EXISTING

- OHU — OVERHEAD UTILITIES
- OHE — OVERHEAD ELECTRIC LINE
- E — UNDERGROUND ELECTRIC LINE
- UFO — UNDERGROUND FIBER OPTIC LINE
- T — UNDERGROUND TELEPHONE LINE
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- GAS VALVE
- FIBER OPTIC BOX
- TELEPHONE SPLICE BOX
- UTILITY POLE
- GUY ANCHOR
- SIGN
- UTILITY VAULT
- WATER SPIGOT

PROPOSED

- STORM SEWER
- SD — SUBSURFACE DRAIN
- S — SANITARY SEWER
- W-8" — WATER MAIN
- EC — ELECTRIC / COMMUNICATION LINE
- G — GAS SERVICE LINE
- FLOWLINE
- SANITARY MANHOLE
- (10) — SANITARY STRUCTURE NO.
- STORM MANHOLE
- STORM INLET
- 100 — STORM STRUCTURE NO.
- FIRE HYDRANT
- WATER VALVE
- FIRE DEPARTMENT CONNECTION

Revisions	Date

Designed: RRL/SJH
Drawn: SJH
Checked: RRL
Scale: 1"=30'
Date: 01-23-2025

STORM SEWER PLAN AND PROFILES
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

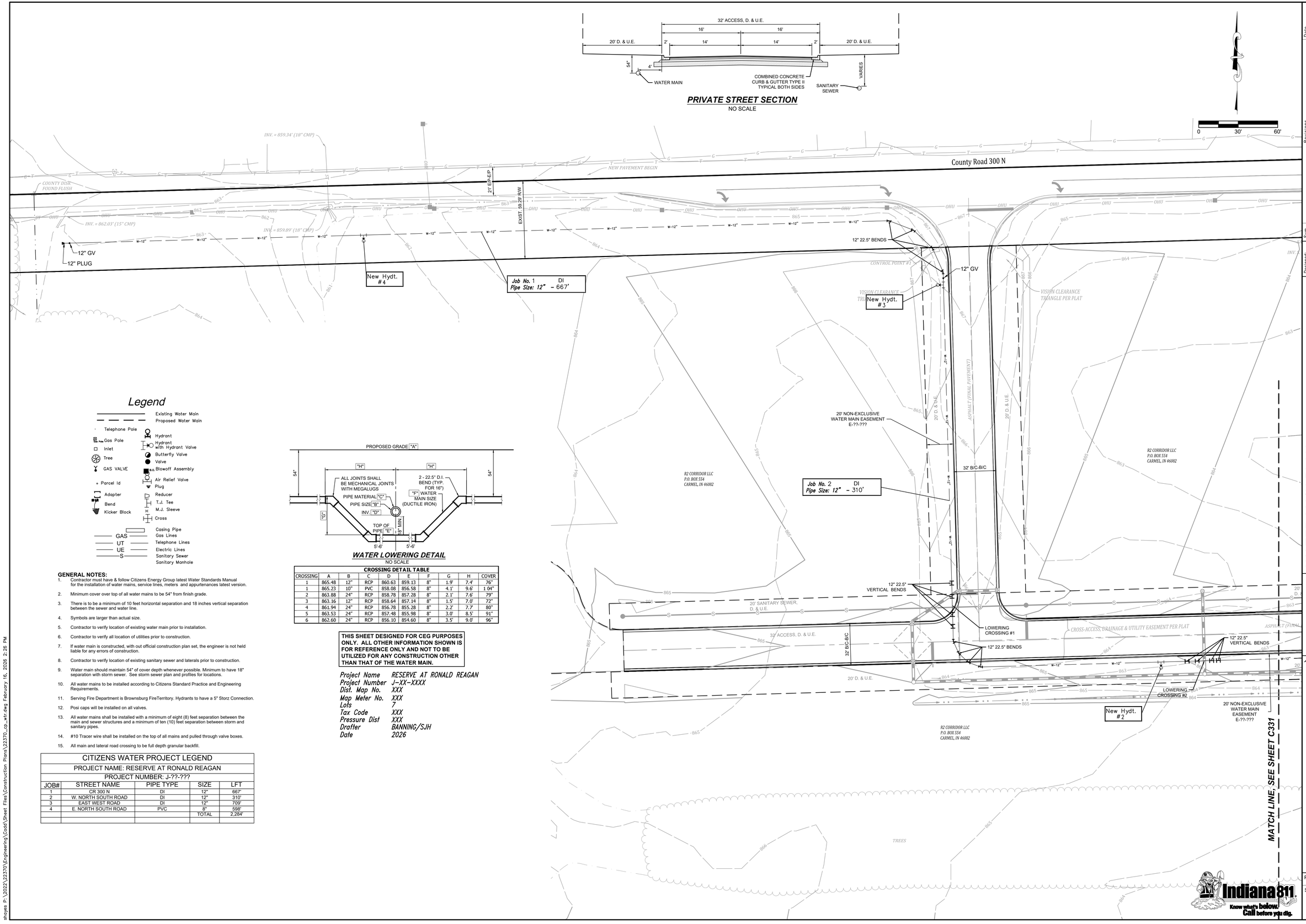
W. CHAD ZIEGLER
REGISTERED
No. PE11200667
STATE OF INDIANA
PROFESSIONAL ENGINEER

BANNING ENGINEERING
853 COLUMBIA ROAD, SUITE #101
PLAINFIELD, IN 46168
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E-MAIL: Banning@BanningEngineering.com
WEB: www.BanningEngineering.com

Project No: 22370
Sheet No: C321

Indiana 811. Know what's below. Call before you dig.

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Legend

- Existing Water Main
- Proposed Water Main
- Telephone Pole
- Gas Pole
- Inlet
- Tree
- GAS VALVE
- Parcel Id
- Adapter
- Bend
- Kicker Block
- Hydrant
- Hydrant with Hydrant Valve
- Butterfly Valve
- Valve
- Blowoff Assembly
- Air Relief Valve
- Plug
- Reducer
- T.J. Tee
- M.J. Sleeve
- Cross
- Casing Pipe
- GAS Gas Lines
- UT Telephone Lines
- UE Electric Lines
- S Sanitary Sewer
- Sanitary Manhole

WATER LOWERING DETAIL
NO SCALE

CROSSING DETAIL TABLE

CROSSING	A	B	C	D	E	F	G	H	COVER
1	865.48	12"	RCP	860.63	859.13	8"	1.9'	7.4'	76"
1	865.23	10"	PVC	858.08	856.58	8"	4.1'	9.6'	1 04"
2	863.88	24"	RCP	858.78	857.28	8"	2.1'	7.6'	79"
3	863.16	12"	RCP	858.64	857.14	8"	1.5'	7.0'	72"
4	861.94	24"	RCP	856.78	855.28	8"	2.2'	7.7'	80"
5	863.53	24"	RCP	857.48	855.98	8"	3.0'	8.5'	91"
6	862.60	24"	RCP	856.10	854.60	8"	3.5'	9.0'	96"

GENERAL NOTES:

1. Contractor must have & follow Citizens Energy Group latest Water Standards Manual for the installation of water mains, service lines, meters and appurtenances latest version.
2. Minimum cover over top of all water mains to be 54" from finish grade.
3. There is to be a minimum of 10 feet horizontal separation and 18 inches vertical separation between the sewer and water line.
4. Symbols are larger than actual size.
5. Contractor to verify location of existing water main prior to installation.
6. Contractor to verify all location of utilities prior to construction.
7. If water main is constructed, with out official construction plan set, the engineer is not held liable for any errors of construction.
8. Contractor to verify location of existing sanitary sewer and laterals prior to construction.
9. Water main should maintain 54" of cover depth whenever possible. Minimum to have 18" separation with storm sewer. See storm sewer plan and profiles for locations.
10. All water mains to be installed according to Citizens Standard Practice and Engineering Requirements.
11. Serving Fire Department is Brownsburg FireTerritory. Hydrants to have a 5" Storz Connection.
12. Posi caps will be installed on all valves.
13. All water mains shall be installed with a minimum of eight (8) feet separation between the main and sewer structures and a minimum of ten (10) feet separation between storm and sanitary pipes.
14. #10 Tracer wire shall be installed on the top of all mains and pulled through valve boxes.
15. All main and lateral road crossing to be full depth granular backfill.

CITIZENS WATER PROJECT LEGEND				
PROJECT NAME: RESERVE AT RONALD REAGAN				
PROJECT NUMBER: J-??-???				
JOB#	STREET NAME	PIPE TYPE	SIZE	LFT
1	CR 300 N	DI	12"	667'
2	W. NORTH SOUTH ROAD	DI	12"	310'
3	EAST WEST ROAD	DI	12"	709'
4	E. NORTH SOUTH ROAD	PVC	8"	598'
			TOTAL	2,284'

THIS SHEET DESIGNED FOR CEG PURPOSES ONLY. ALL OTHER INFORMATION SHOWN IS FOR REFERENCE ONLY AND NOT TO BE UTILIZED FOR ANY CONSTRUCTION OTHER THAN THAT OF THE WATER MAIN.

Project Name RESERVE AT RONALD REAGAN
Project Number J-XX-XXXX
Dist. Map No. XXX
Map Meter No. XXX
Lots 7
Tax Code XXX
Pressure Dist XXX
Drafter BANNING/SJH
Date 2026

Date
Revisions
Sym.
Designed: RRL/SJH
Drawn: SJH
Checked: RRL
Scale: 1"=30'
Date: 01-23-2025

WATER MAIN PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

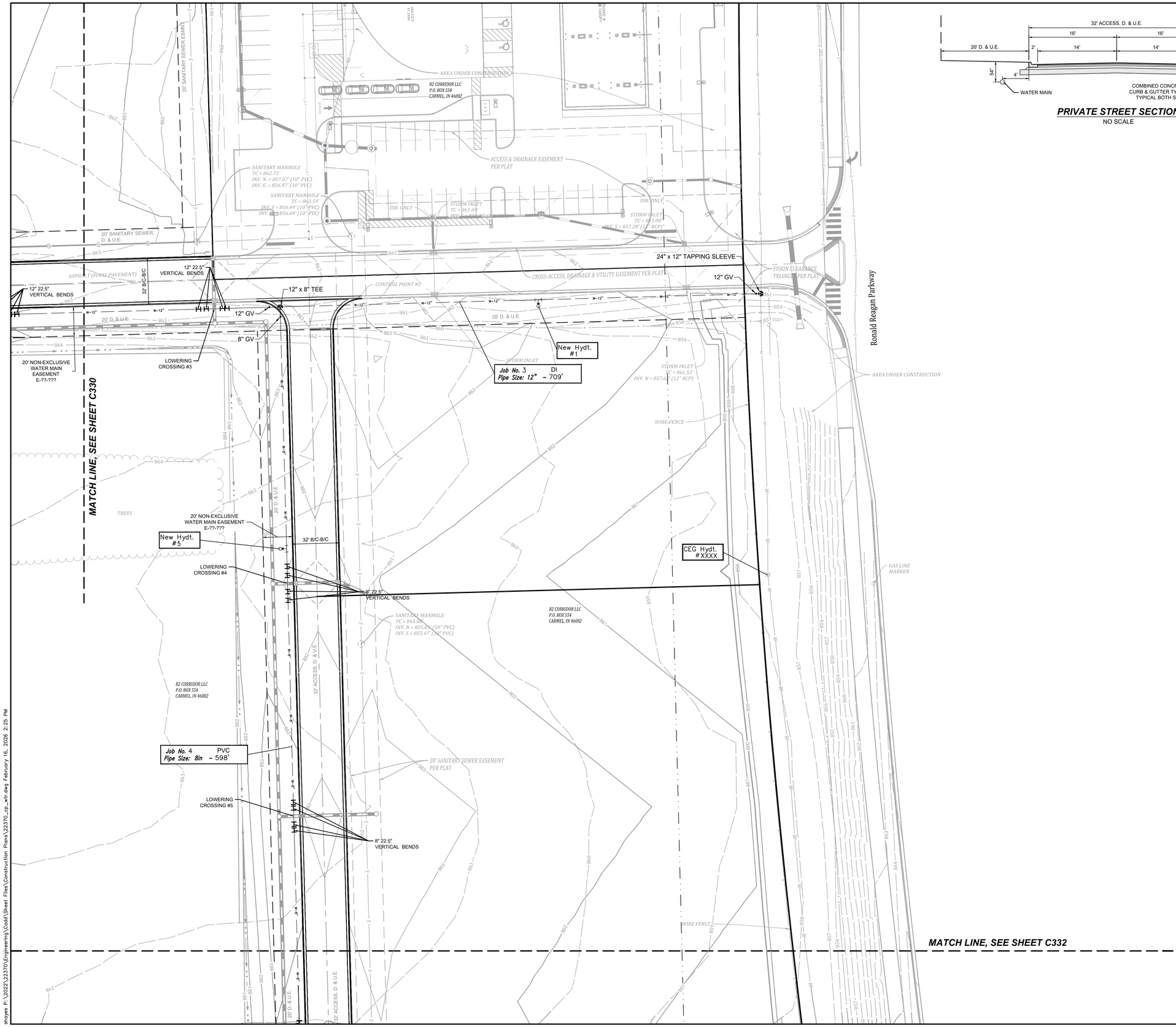
JOSHUA A. BELL — REGISTERED — No. PE11800786 — STATE OF INDIANA — PROFESSIONAL ENGINEER

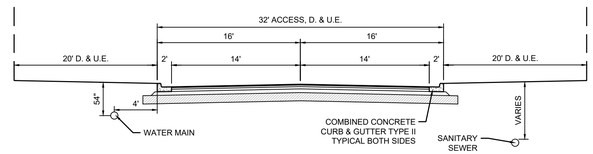
BANNING ENGINEERING
853 COLUMBIA ROAD SUITE #101
PLAINFIELD, IN 46168
BUS: (317) 707-3700 FAX: (317) 707-3800
E-MAIL: Banning@BanningEngineering.com
WEB: www.BanningEngineering.com

Project No: 22370
Sheet No: C330

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PRIVATE STREET SECTION
NO SCALE

0 30' 60'

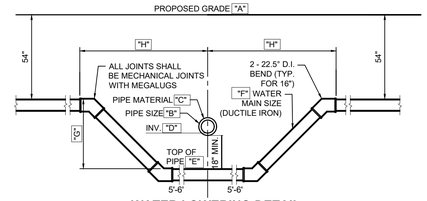
Legend

- Existing Water Main
- Proposed Water Main
- Telephone Pole
- Gas Pole
- Inlet
- Tree
- GAS VALVE
- Parcel Id
- Adapter
- Bend
- Kicker Block
- Hydrant
- Hydrant with Hydrant Valve
- Butterfly Valve
- Valve
- Blowoff Assembly
- Air Relief Valve
- Plug
- Reducer
- T.J. Tee
- M.J. Sleeve
- Cross
- Casing Pipe
- GAS Gas Lines
- UT Telephone Lines
- UE Electric Lines
- S Sanitary Sewer
- Sanitary Manhole

GENERAL NOTES:

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CITIZENS WATER PROJECT LEGEND				
PROJECT NAME: RESERVE AT RONALD REAGAN				
PROJECT NUMBER: J-??-???				
JOB#	STREET NAME	PIPE TYPE	SIZE	LFT
1	CR 300 N	DI	12"	667'
2	W. NORTH SOUTH ROAD	DI	12"	310'
3	EAST WEST ROAD	DI	12"	709'
4	E. NORTH SOUTH ROAD	PVC	8"	598'
			TOTAL	2,284'



WATER LOWERING DETAIL
NO SCALE

CROSSING DETAIL TABLE

CROSSING	A	B	C	D	E	F	G	H	COVER
1	865.48	12"	RCP	860.63	859.13	8"	1.9'	7.4'	76"
1	865.23	10"	PVC	858.08	856.58	8"	4.1'	9.6'	1 04"
2	863.88	24"	RCP	858.78	857.28	8"	2.1'	7.6'	79"
3	863.16	12"	RCP	858.64	857.14	8"	1.5'	7.0'	72"
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5	863.53	24"	RCP	857.48	855.98	8"	3.0'	8.5'	91"
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Project Name RESERVE AT RONALD REAGAN
Project Number J-XX-XXXX
Dist. Map No. XXX
Map Meter No. XXX
Lots 7
Tax Code XXX
Pressure Dist XXX
Drafter BANNING/SJH
Date 2026

Indiana 811. Know what's below. Call before you dig.

Revisions | Date | Sym.

Designed: RRL/SJH
Drawn: SJH
Checked: RRL
Scale: 1"=30'
Date: 01-23-2025

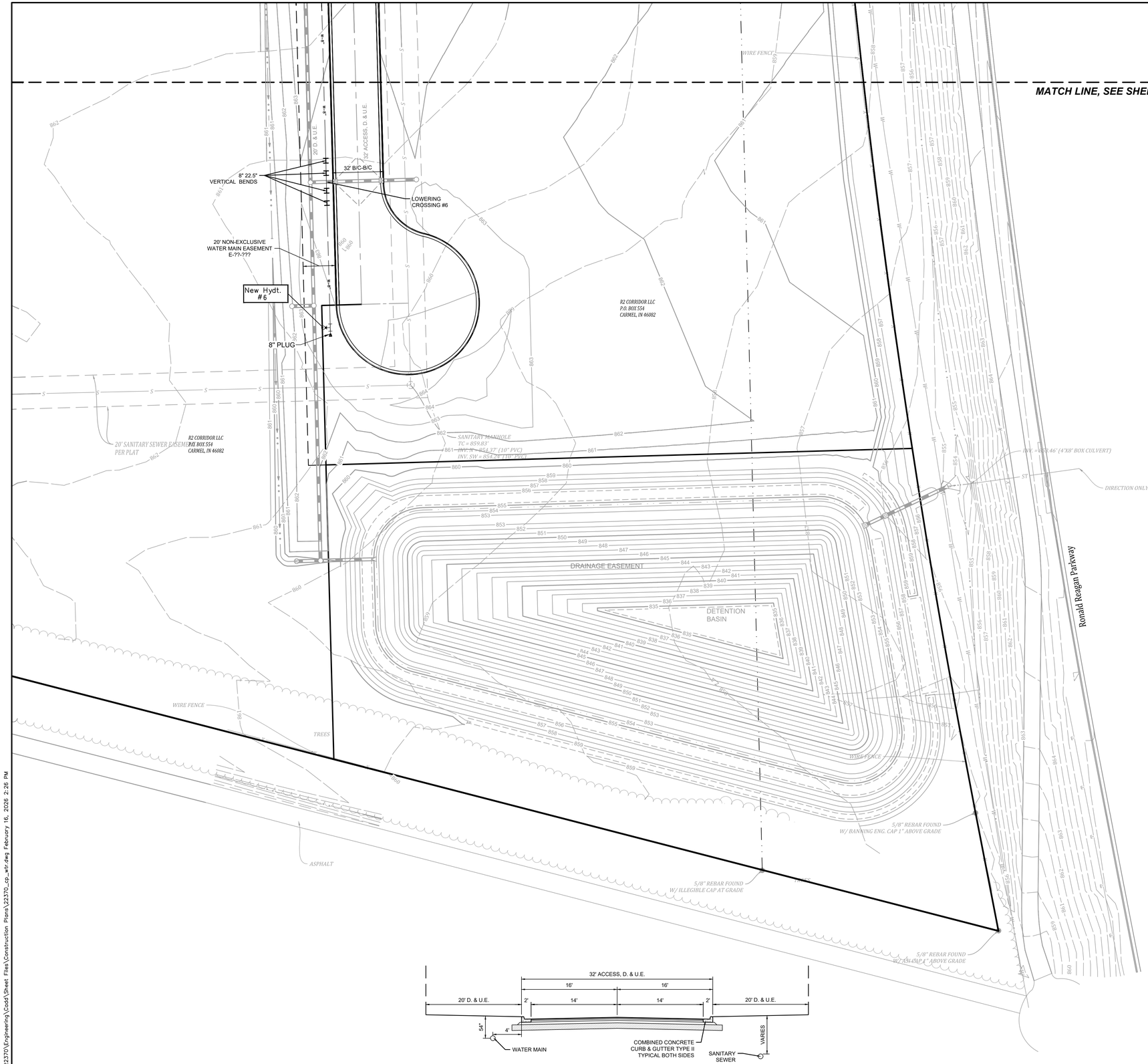
WATER MAIN PLAN
RESERVE AT RONALD REAGAN
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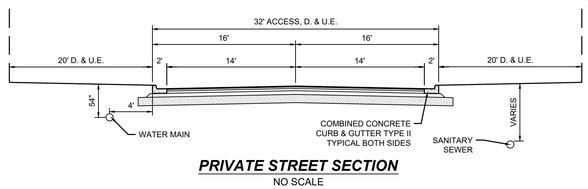
JOSHUA A. REGISTERED No. PE11800786 STATE OF INDIANA PROFESSIONAL ENGINEER

BANNING ENGINEERING
853 COLUMBIA ROAD, SUITE #101
PLAINFIELD, IN 46168
BUS: (317) 707-3700, FAX: (317) 707-3800
E-MAIL: Banning@BanningEngineering.com
WEB: www.BanningEngineering.com

Project No: 22370
Sheet No: C331

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PRIVATE STREET SECTION

NO SCALE

0 30' 60'

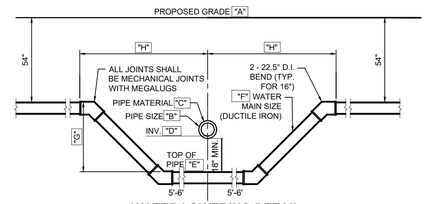
Legend

- Existing Water Main
- Proposed Water Main
- Telephone Pole
- Gas Pole
- Inlet
- Tree
- GAS VALVE
- Parcel Id
- Adapter
- Bend
- Kicker Block
- Hydrant
- Hydrant with Hydrant Valve
- Butterfly Valve
- Valve
- Blowoff Assembly
- Air Relief Valve
- Plug
- Reducer
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- Sanitary Manhole

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PROJECT NUMBER: J-??-???				
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			TOTAL	2,284'



WATER LOWERING DETAIL

NO SCALE

CROSSING DETAIL TABLE

CROSSING	A	B	C	D	E	F	G	H	COVER
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2	863.88	24"	RCP	858.78	857.28	8"	2.1'	7.6'	79"
3	863.16	12"	RCP	858.64	857.14	8"	1.5'	7.0'	72"
4	861.94	24"	RCP	856.78	855.28	8"	2.2'	7.7'	80"
5	863.53	24"	RCP	857.48	855.98	8"	3.0'	8.5'	91"
6	862.60	24"	RCP	856.10	854.60	8"	3.5'	9.0'	96"

THIS SHEET DESIGNED FOR CEG PURPOSES ONLY. ALL OTHER INFORMATION SHOWN IS FOR REFERENCE ONLY AND NOT TO BE UTILIZED FOR ANY CONSTRUCTION OTHER THAN THAT OF THE WATER MAIN.

Project Name	*RESERVE AT RONALD REAGAN*
Project Number	*J-XX-XXXX*
Dist. Map No.	*XXX*
Map Meter No.	*XXX*
Lots	*7*
Tax Code	*XXX*
Pressure Dist	*XXX*
Drafter	*BANNING/SJH*
Date	*2026*

Indiana 811. Know what's below. Call before you dig.

Revisions | Sym. | Date

Designed: RRL/SJH
Drawn: SJH
Checked: RRL
Scale: 1"=30'
Date: 01-23-2025

WATER MAIN PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

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Project No: 22370

Sheet No: C332

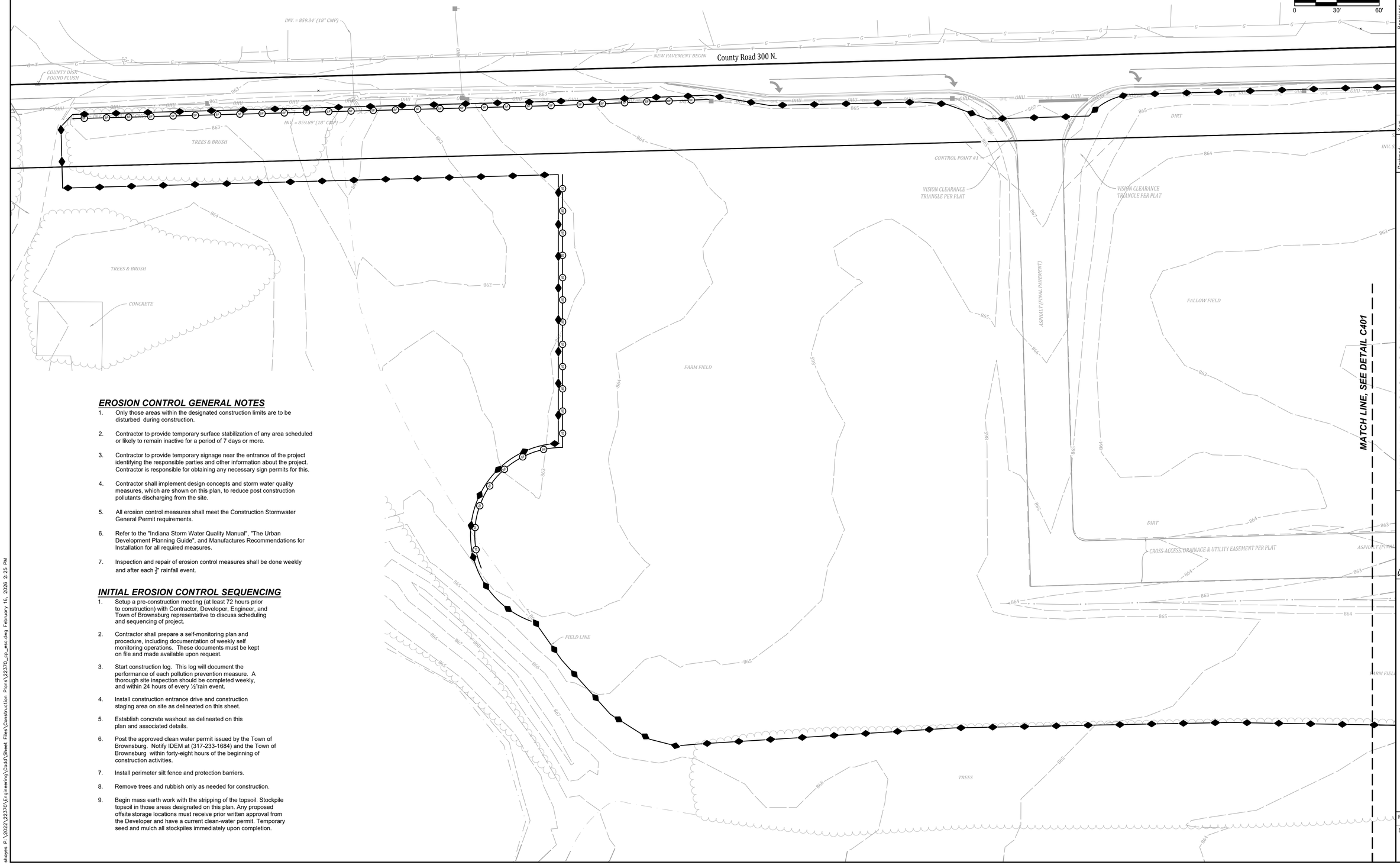
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EROSION CONTROL PLAN LEGEND

- CURB INLET BASKET — SEE DETAIL ON SHEET C500
- CONSTRUCTION LIMITS
- SILT FENCE (SF) — SEE DETAIL ON SHEET C500

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0 30' 60'



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INITIAL EROSION CONTROL PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

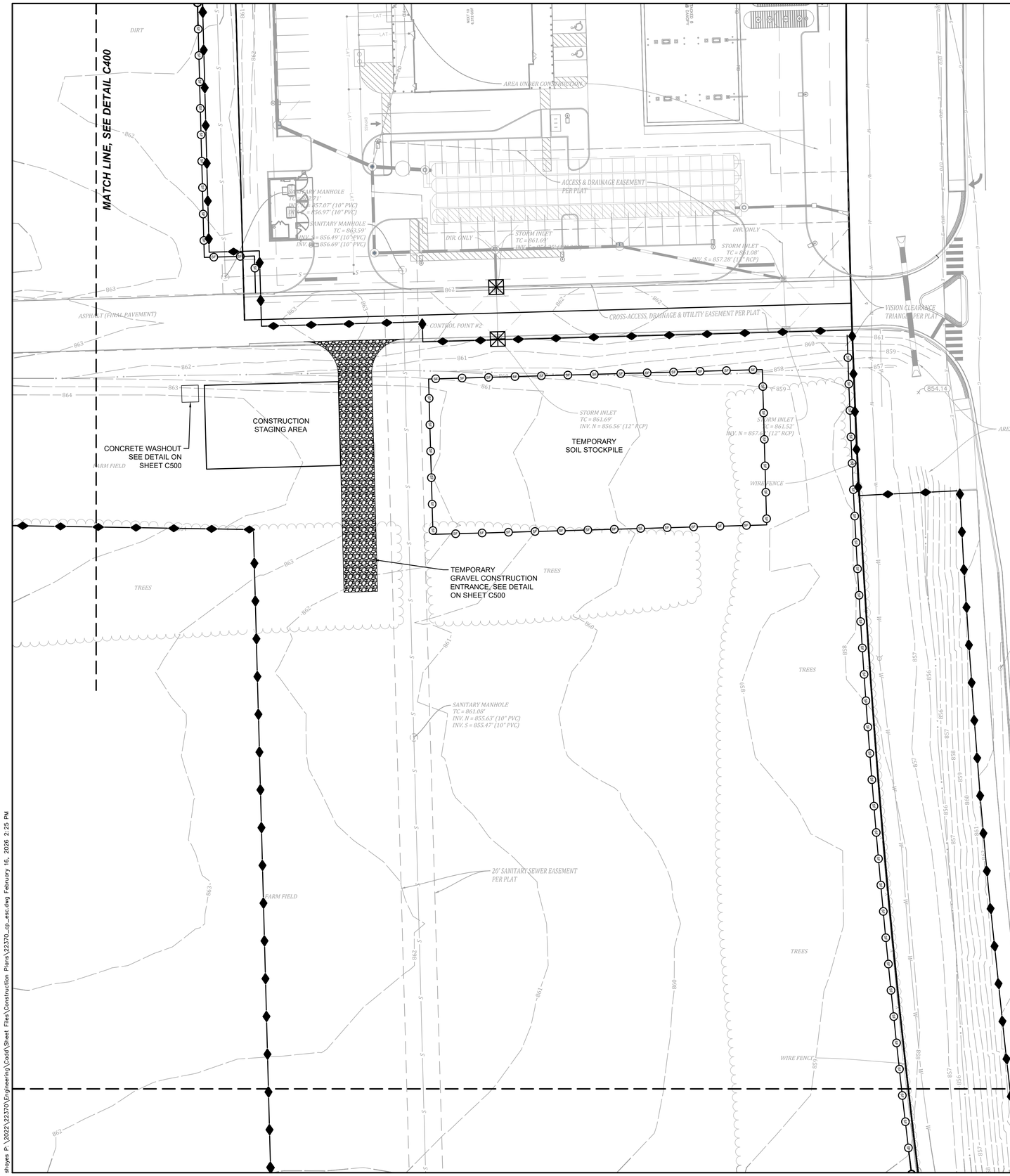
W. CHAD ZIEGLER — REGISTERED No. PE11200667 STATE OF INDIANA — PROFESSIONAL ENGINEER

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Project No: 22370

Sheet No: C400

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0 30' 60'

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EROSION CONTROL PLAN LEGEND

- CURB INLET BASKET — SEE DETAIL ON SHEET C500
- CONSTRUCTION LIMITS
- (SF) SILT FENCE — SEE DETAIL ON SHEET C500

Indiana 811 — Know what's below. Call before you dig.

Revisions	Sym.	Date

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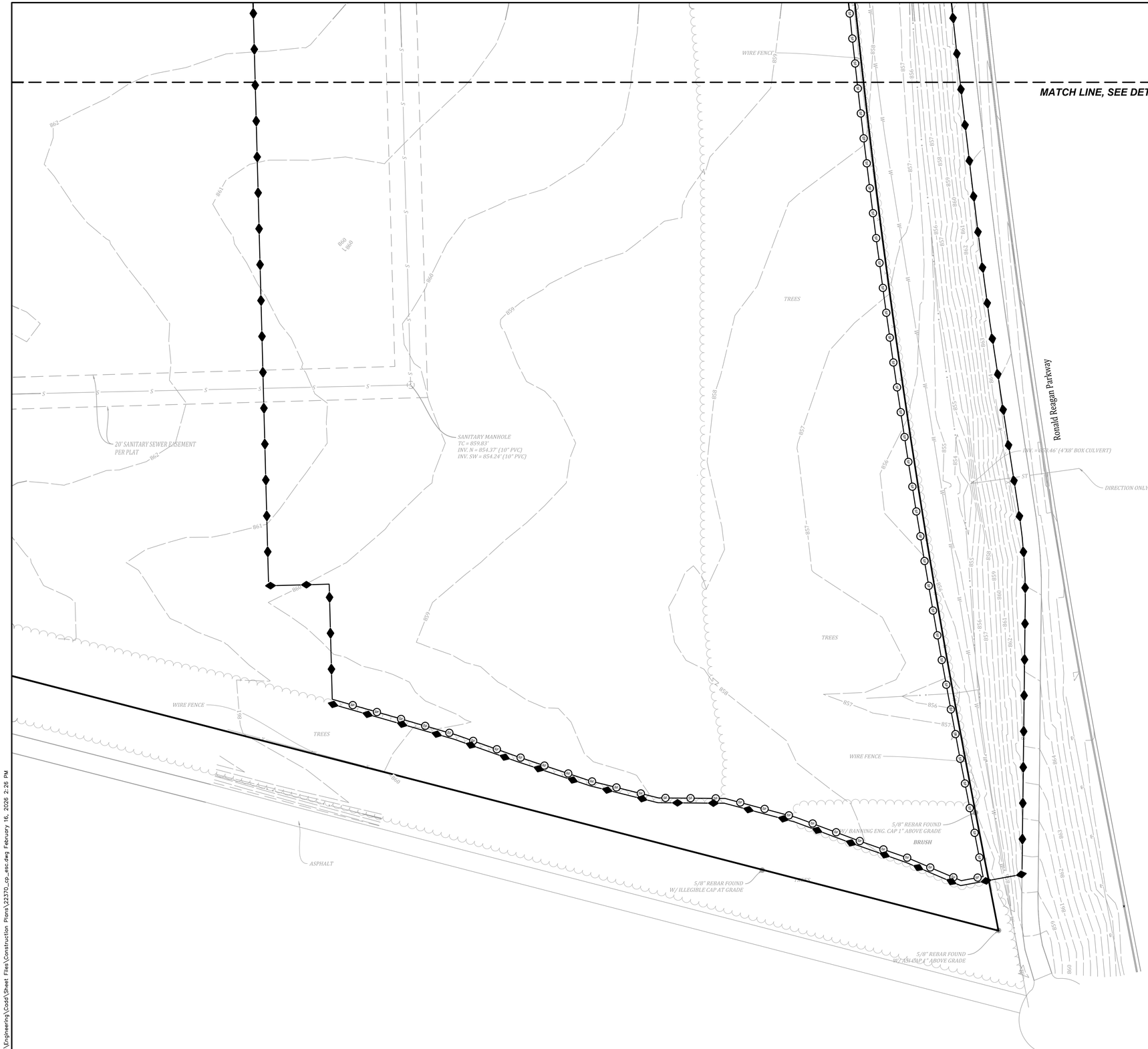
INITIAL EROSION CONTROL PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

W. CHAD ZIEGLER — REGISTERED No. PE11200667 — STATE OF INDIANA — PROFESSIONAL ENGINEER

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Project No: 22370
Sheet No: C401

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0 30' 60'

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EROSION CONTROL PLAN LEGEND

- CURB INLET BASKET — SEE DETAIL ON SHEET C500
- CONSTRUCTION LIMITS
- SF — SILT FENCE — SEE DETAIL ON SHEET C500

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Revisions	Sym.	Date

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INITIAL EROSION CONTROL PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

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Project No: 22370
Sheet No: C402

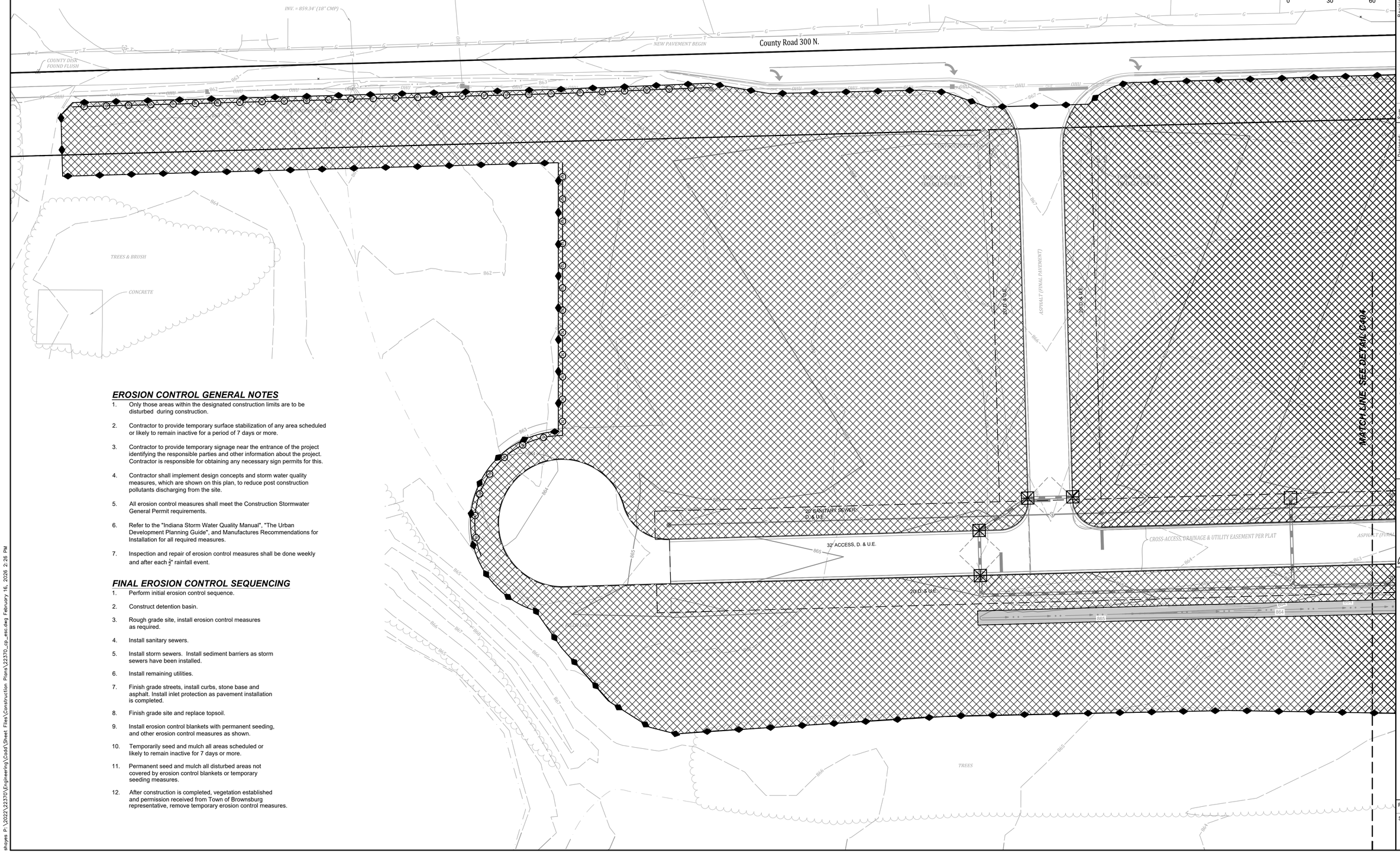
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EROSION CONTROL PLAN LEGEND

- EROSION CONTROL BLANKET W/PERMANENT SEEDING (NORTH AMERICAN GREEN S-150) SEE DETAIL ON SHEET C500
- PERMANENT SEEDING & MULCHING SEE DETAIL ON SHEET C500
- TEMPORARY SEEDING SEE DETAIL ON SHEET C500
- CHECK DAM LOCATION SEE DETAIL ON SHEET C500
- RIP-RAP SEE DETAIL ON SHEET C500
- CURB INLET BASKET SEE DETAIL ON SHEET C500
- WELDED WIRE INLET PROTECTION SEE DETAIL ON SHEET C500
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FINAL EROSION CONTROL SEQUENCING

1. Perform initial erosion control sequence.
2. Construct detention basin.
3. Rough grade site, install erosion control measures as required.
4. Install sanitary sewers.
5. Install storm sewers. Install sediment barriers as storm sewers have been installed.
6. Install remaining utilities.
7. Finish grade streets, install curbs, stone base and asphalt. Install inlet protection as pavement installation is completed.
8. Finish grade site and replace topsoil.
9. Install erosion control blankets with permanent seeding, and other erosion control measures as shown.
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FINAL EROSION CONTROL PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

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Project No: 22370

Sheet No: C403

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- PERMANENT SEEDING & MULCHING SEE DETAIL ON SHEET C500
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- WELDED WIRE INLET PROTECTION SEE DETAIL ON SHEET C500
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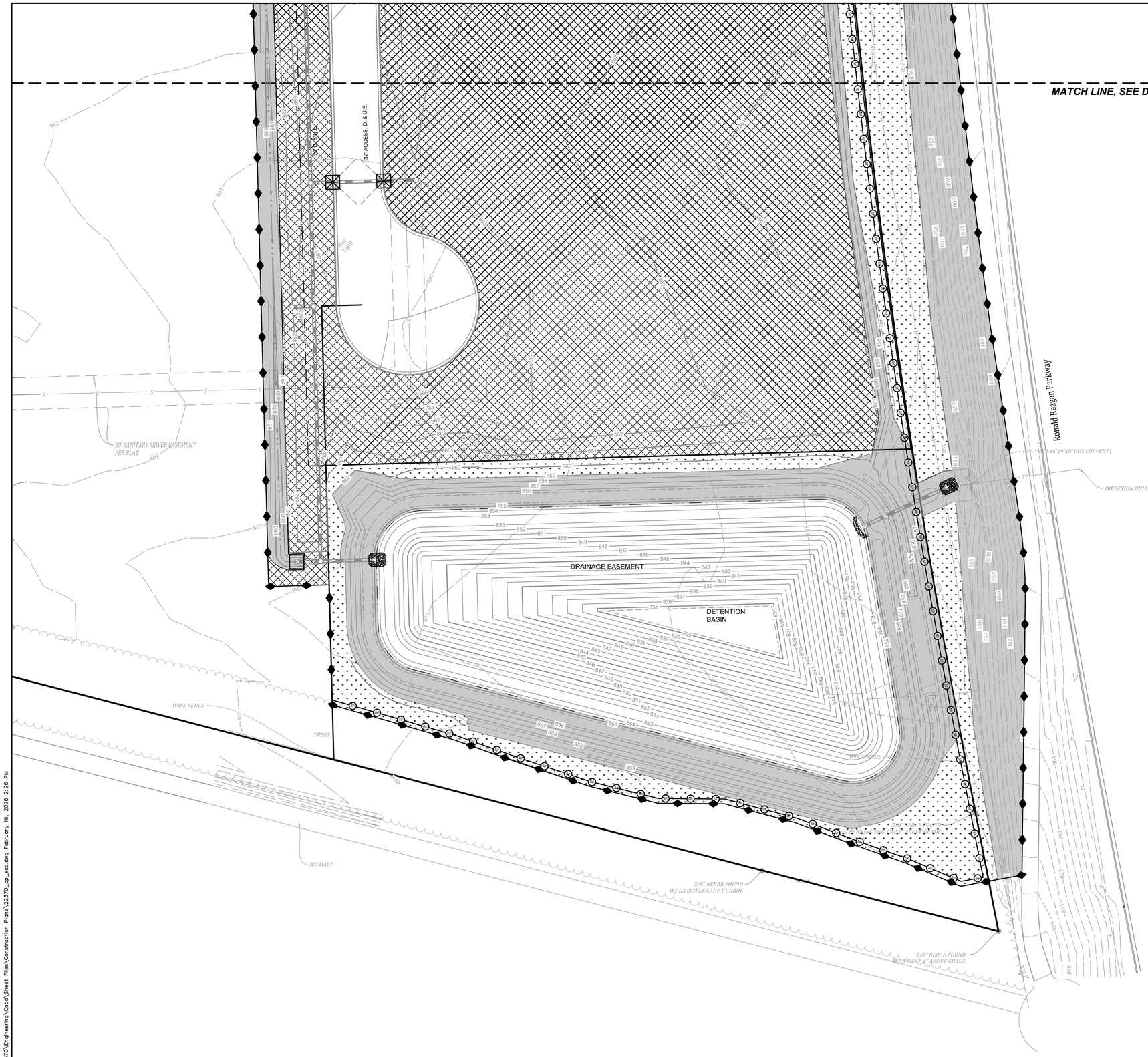
FINAL EROSION CONTROL PLAN
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Project No: 22370
Sheet No: C404

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FINAL EROSION CONTROL PLAN
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INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

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Construction Plan - General Plan Components (Section A)

A1 - Index of the location of required plan elements in the construction plan:
The plan index should include a list of the required items in the CSGP and where they occur in the plan. Plan preparers often have their plan index mirror items in the IDEM standard plan review checklist. An MS4 may have different requirements and plan expectations based on their local ordinance.

A2 - A vicinity map depicting the project site location in relationship to recognizable local landmarks, towns, and major roads:
See Plan Set: Title Sheet, C100

A3 - Narrative of the nature and purpose of the project:
This project consists the construction of new private roads, pads for future developments, detention basin, storm sewers, sanitary sewers and water mains.

A4 - Latitude and longitude to the nearest fifteen (15) seconds:
Latitude: 39°48'23.66" N
Longitude: 86°21'05.34" W

A5 - Legal description of the project site:
See Plan Set: Overall Plan, C102

A6 - 11 X 17-inch plat showing building lot numbers/boundaries and road layout/names:
Provided as attachment to this narrative.

A7 - Boundaries of the one hundred (100) year floodplains, floodway fringes, and floodways
See FIRMette, this sheet.

A8 - Land use of all adjacent properties:
North: Residential
South: Industrial
East: Woods / Open Field
West: Woods / Farm Field

A9 - Identification of a U.S. EPA approved or established TMDL:
None

A10 - Name(s) of the receiving water(s):
East Fork White Lick Creek

A11 - Identification of discharges to a water on the current 303(d) list of impaired waters and the pollutant(s) for which it is impaired:
Impairments: E. coli

A12 - Soils map of the predominate soil types:
See this sheet

A13 - Identification and location of all known wetlands, lakes, and water courses on or adjacent to the project site (construction plan, existing site layout):
See Plan Set: Existing Topography, C101

A14 - Identification of any other state or federal water quality permits or authorizations that are required for construction activities:
401 Water Quality Certification (IDEM): None
Section 404 Permit (USACE): None
Construction in a Floodway (IDNR): None

A15 - Identification and delineation of existing cover, including natural buffers:
See Plan Set: Existing Topography, C101

A16 - Existing site topography at an interval appropriate to indicate drainage patterns:
See Plan Set: Existing Topography, C101

A17- Location(s) where run-off enters the project site:
Run-off enters the site on the north & west side.

A18 - Location(s) where run-off discharges from the project site prior to land disturbance:
Run-off discharges the site on the Southeast side of the site through an existing 4'x8' culvert under Ronald Reagan Parkway.

A19 - Location of all existing structures on the project site:
See Plan Set: Existing Topography, C101

A20 - Existing permanent retention or detention facilities, including manmade wetlands, designed for the purpose of stormwater management:
See Plan Set: Existing Topography, C101

A21 - Locations where stormwater may be directly discharged into ground water, such as abandoned wells, sinkholes, or karst features:
No known sinkholes, wells or karst features.

A22 - Size of the project area expressed in acres:
49.87 Acres +/-

A23 - Total expected land disturbance expressed in acres:
16.3 Acres +/-

A24 - Proposed final topography:
See Plan Set: Grading and Drainage Plan, C110-C113

A25 - Locations and approximate boundaries of all disturbed areas:
Construction Limits, Initial and Final Erosion Control Plan, C400-C405

A26 - Locations, size, and dimensions of all stormwater drainage system such as culverts, stormwater sewer, and conveyance channels:
See Plan Set: Storm Sewer Plan and Profiles, C320-C321

A27 - Locations of specific points where stormwater and non-stormwater discharges will leave the project site:
See Plan Set: Grading and Drainage Plan, C110-C113

A28 - Location of all proposed site improvements, including roads, utilities, lot delineation and identification, proposed structures, and common areas:
See Plan Set: Grading and Drainage Plan, C110-C113

A29 - Location of all on-site and off-site soil stockpiles and borrow areas:
See Plan Set: Initial and Final Erosion Control Plan, C400-C405

A30 - Construction support activities that are expected to be part of the project:
Support activities include, concrete washout, construction entrance and construction staging area.

A31 - Location of any in-stream activities that are planned for the project including, but not limited to, stream crossings and pump arounds:
None

Stormwater Pollution Prevention - Construction Component (Section B)

B1 - Description of the potential pollutant generating sources and pollutants, including all potential non-stormwater discharges:
Silt and sediment from exposed soils, leaves, mulch, vehicular sources such as leaking fuel or oil, brake fluid, brake dust, antifreeze, trash, debris, biological agents found in trash, fertilizers, herbicides, pesticides, lime dust and concrete washout.

B2 - Stable construction entrance locations and specifications:
For Location, See Plan Set: Initial Erosion Control Plan, C401
For Detail, See See Plan Set: Erosion Control Details, C500

B3 - Specifications for temporary and permanent stabilization:
Temporary seeding is required for any area left for 7 days or longer within this project, such as soil stockpiles. Temporary seeding is also required in areas that will be disturbed in future projects. This seeding will be placed after finish grading and topsoil replacement.
For Locations See Plan Set: Initial and Final Erosion Control Plan, C400-C405
For Detail See Plan Set: Erosion Control Details, C500

B4 - Sediment control measures for concentrated flow areas:
Erosion control Blankets, Rock Check Dams, and Rip Rap will be installed to reduce and collect sediment from concentrated flow.
For Locations see Plan Set : Initial and Final Erosion Control Plans, C400 - C405
For details See Plan Set : Erosion Control Details, C500

B5 - Sediment control measures for sheet flow areas:
Silt fence will be installed along the edge of the project to collect sediment runoff.
For Locations see Plan Set : Initial and Final Erosion Control Plans, C400 - C405
For details See Plan Set : Erosion Control Details, C500

B6 - Run-off control measures:
Almost all of the erosion control measures used at this site can be viewed as runoff control measures, with the possible exception of the construction entrance and the concrete washout area, in that they either reduce the velocity, such as silt fence, rock check dams, inlet protection measures, and holding ponds, or reduce the energy of the runoff, such as rip rap. Even erosion control blankets could be said to be a runoff control measure in that they certainly reduce the erosiveness of the runoff.
For Locations see Plan Set : Initial and Final Erosion Control Plans, C400 - C405
For details See Plan Set : Erosion Control Details, C500

B7 - Stormwater outlet protection location and specifications:
Rip Rap will be install at all storm pipe outlets into the pond. An erosion control blanket will be install at the ponds emergency overflow as outlet protection.
For Locations see Plan Set : Final Erosion Control Plan, C403-C405
For details See Plan Set : Erosion Control Details, C500

B8 - Grade stabilization structure locations and specifications:
None Required.

B9 - Dewatering applications and management methods:
Description and Purpose
Dewatering operations are practices that manage the discharge of pollutants when non- stormwater and accumulated precipitation must be removed from a work location so that construction work may be accomplished.
Suitable Applications
These practices are implemented for discharges of non-stormwater from construction sites. Non-stormwaters include, but are not limited to, groundwater,water from cofferdams, water diversions, and waters used during construction activities that must be removed from a work area. Practices identified in this section are also appropriate for implementation when managing the removal of accumulated precipitation (stormwater) from depressed areas at a construction site.
Limitations
Site conditions will dictate design and use of dewatering operations. The controls discussed in this best management practice (BMP) address sediment only. The controls detailed in this BMP only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods. Dewatering operations will require, and must comply with, applicable local permits.
Implementation
Dewatering discharges must not cause erosion at the discharge point. A variety of methods can be used to treat water during dewatering operations. Several devices are presented below and provide options to achieve sediment removal. The size of particles present in the sediment and permit or receiving water limitations on sediment are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate.

B10 - Measures utilized for work within waterbodies:
None.

B11 - Maintenance guidelines for each proposed stormwater quality measure:
Each Measure shall be inspected weekly and after each 1/2" rainfall event. Follow maintenance guidelines for each measure as specified in each relevant construction detail.
See Plan Set: Erosion Control Detail, C500

B12 - Planned construction sequence that describes the implementation of stormwater quality measures in relation to land disturbance:
See Plan Set: Initial and Final Erosion Control Plan, C400-C405

B13 - Provisions for erosion and sediment control on individual residential building lots regulated under the proposed project:
N/A

B14 - Material handling and spill prevention and spill response plan meeting the requirements in 327 IAC 2-6.1: & 315 - Material handling and storage procedures associated with construction activity:
MATERIAL HANDLING:
1. The proper management and disposal of waste should be practiced on site at all times to reduce pollution of storm waterrunoff. Hazardous waste should always be disposed of through a designated hazardous waste management or recycling facility.
2. Designate a waste collection area on-site that does not receive a substantial amount of runoff from upland areas and does not drain directly into a water body.
3. Keep products in original containers with original labels and material safety data information attached. Make sure products are properly sealed to prevent leaks and spills and stored in a weather proof self contained area away from heat, sparks and flames.
4. A program for recycling or disposal of materials associated with or from the project site shall be established by the contractor. All recycling canisters shall be clearly labeled.
5. All construction activities are to be monitored and maintained by the contractor. As each new subcontractor comes on-site, the contractor will conduct and document a meeting to ensure awareness of the pollutant prevention program. Guidelines for proper handling, storage and disposal of construction site wastes shall be posted in the storage and use areas, and workers shall be trained in these practices.
6. Containers and equipment must be inspected regularly for leaks, corrosion, support or foundation failure, or any other signs of deterioration and must be tested for soundness. Any found to be defective should be repaired or replaced immediately.

SPILL PREVENTION PLAN:
Purpose:
The intention of this Spill Prevention, Control and Countermeasures (SPCC) is to establish the procedures and equipment required to prevent the discharge of oil and hazardous substances in quantities that violate applicable water quality standards, cause a sheen upon or discoloration of the surface of navigable waters or adjoining shorelines, or cause sludge or emulsion to be deposited beneath the surface of the water or adjoining shorelines. The Plan also establishes the activities required to mitigate such discharges (i.e., countermeasures) should they occur.
Definitions:
Pollutant: means pollutant of any kind or in any form, including but not limited to sediment, paint, cleaning agent, concrete washout, pesticides, nutrients, trash, hydraulic fluids, fuel, oil, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged soil.
Discharge:
Includes but is not limited to, any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.

Navigable Waters:
Means all waters of the United States that are connected with a navigable stream,lake, or sea.
[Note: This definition is usually interpreted to mean any wastewater (even normallydry wash or storm sewer) that eventually drains into a navigable stream].
Plan Review and Amendments:
This Plan shall be reviewed and/or amended, if necessary, whenever there is a change in the design of the site, construction, operation, or maintenance which materially affects the site's potential for the discharge of regulated material.

Prediction of Potential Spills:
1. Nearest Navigable Water: East Fork White Lick Creek
2. Drainage System: All storm drainage leaves the site by open ditches and closed storm systems to East Fork White Lick Creek.
3. Possible Spill Sources (During and post construction): Vehicular sources such as leaking fuel or oil, brake fluid, grease, antifreeze; trash and debris, biological agents found in trash and debris, fertilizers, household items including but not limited to cleaning agents, chemicals, paint, herbicides and pesticides.
4. Groundwater Contamination: The facility maintains NO above ground or under ground storage tanks at this site. Therefore, it is felt that there is little or no possibility of post construction groundwater contamination. The facility does have public sanitary sewer and public water.

Alert Procedures for Spills:
1. Any personnel observing a spill will immediately instigate the following procedure:
   a. Dialing "911" from any telephone.
   b. Notify the appropriate emergency personnel.
2. The Emergency Coordinator will then take the following actions:
   a. Barricade the area allowing no vehicles to enter or leave the spill zone.
   b. Notify the Indiana Department of Environmental Management, Office of Emergency Response by calling the appropriate telephone number:
      Office 317-233-7745
      Toll Free 800-233-7745
      Also the National Response Center at 800-424-8802 and provide the following information:
   i. Time of observation of the spill
   ii. Location of the spill
   iii. Identity of material spilled
   iv. Probable source of the spill
   v. Probable time of the spill
   vi. Volume of the spill and duration
   vii. Present and anticipated movement of the spill
   viii. Weather conditions
   ix. Personnel at the scene
   x. Action initiated by personnel
   c. Notify the Town of Brownsburg Fire Department Phone: 9-1-1
   d. Notify the Town of Brownsburg Police department Phone: 9-1-1
   e. Notify waste recovery contractor, maintenance personnel or other contractual personnel as necessary for cleanup.
   f. Coordinate and monitor cleanup until the situation has been stabilize and all spills have been eliminated.
   g. Cooperate with the IDEM-OER on procedures and reports involved with the event.

Cleanup Parameters:
1. The Developer shall be continually kept informed, maintain lists of qualified contractors and available Vac-trucks, tank pumpers and other equipment readily accessible for clean-up operations. In addition, a continually updated list of available absorbent materials and clean-up supplies should be kept on site.
2. All maintenance personnel will be made aware of techniques for prevention and containment of spills. They will be informed of the requirements and procedures outlined in this plan. They will be kept abreast of current developments or new information on the prevention of spills and / or necessary alterations to this plan.
3. If spills occur which could endanger human life, this becomes the primary concern. The discharge of the life saving protection function will be carried out by the local police and fire departments.
4. Absorbent materials, which are used in cleaning up spilled materials, will be disposed of in a manner subject to the approval of the Indiana Department of Environmental Management. Flushing of spilled material with water will not be permitted unless so authorized by the Indiana Department of Environmental Management.

ADDITIONAL STORMWATER POLLUTION PREVENTION MEASURES VEHICLE & EQUIPMENT MAINTENANCE
Description and Purpose:
Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately.
Suitable Applications:
These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.
Limitations:
Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with a stabilized Construction Entrance/ Exit. Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks).
Implementation:
If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.

Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.

Place a stockpile of spill cleanup materials where it will be readily accessible.

ADDITIONAL STORMWATER POLLUTION PREVENTION MEASURES (CONTINUED):
All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.

Use absorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.

Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately, or remove from site.

Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.

Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.

Train employees and subcontractors in proper maintenance and spill cleanup procedures.

Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.

Do not place used oil in a dumpster or pour into a storm drain or watercourse.

Properly dispose of or recycle used batteries.

Do not bury used tires.

Repair leaks of fluids and oil immediately.

Keep ample supplies of spill cleanup materials onsite.

Maintain waste fluid containers in leak proof condition.

VEHICLE AND EQUIPMENT FUELING
Description and Purpose: Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Limitations: Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with a Stabilized Construction Entrance/Exit.

Implementation: Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.

Discourage "topping off" of fuel tanks.

Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should be disposed of properly after use.

Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.

Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the absorbent materials promptly and dispose of properly. Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas.

Train employees and subcontractors in proper fueling and cleanup procedures.

Dedicated fueling areas should be protected from stormwater runon and runoff and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level grade areas.

Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.

Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.

Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.

Keep ample supplies of spill cleanup materials onsite.

Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

CONCRETE WASHOUT
The following steps will help reduce stormwater pollution from concrete wastes:
Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready mix concrete supplier before any deliveries are made.

Incorporate requirements for concrete waste management into material supplies and subcontractor agreements.

Store dry and wet materials under cover, away from drainage areas.

Avoid mixing excess amounts of fresh concrete.

Perform washout of concrete trucks offsite or in designated areas only. Do not wash out concrete trucks into storm drains, open ditches, streets, or streams. Do not allow excess concrete to be dumped onsite, except in designated areas.

For onsite washout:
-Locate washout area at least 50 feet from storm drains, open ditches, or water bodies.
-Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste. Liquid that accumulates in a washout area may be high in alkalinity and must be disposed of properly.
-Wash out wastes into the temporary pit where the concrete can set, be broken up, and then disposed properly.
-Avoid creating runoff by draining water to a bermed or level area when washing concrete to remove fine particles and expose the aggregate.
-Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.

SOLID WASTE MANAGEMENT
Description and Purpose: Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications: This BMP is suitable for construction sites where the following wastes are generated or stored: Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction.

Packaging materials including wood, paper, and plastic.

Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces and masonry products.

Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes.

Construction wastes including brick, timber, steel and metal scraps, pipe and electrical cuttings, nonhazardous equipment parts, styrofoam and other materials from transport and package construction materials

Implementation:
Select designated waste collection areas onsite.

Inform contractors that you will accept only watertight dumpsters for onsite use.
Inspect dumpsters for leaks and repair any dumpster that is not watertight.

Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.

Plan for additional containers and more frequent pickup during the demolition phase of construction.

Collect site trash daily, especially during rainy and windy conditions.

Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.

Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.

Arrange for regular waste collection before containers overflow.

Clean up immediately if a container does spill.

Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Incorporate requirements for solid waste management into builder and subcontractor agreements.

Littering on the project site should be prohibited.

To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.

Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.

Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.

Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.

Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.

Construction debris and waste should be removed from the site biweekly or more frequently as needed.

Construction material visible to the public should be stored or stacked in an orderly manner.

Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measure to elevate waste from site surfaces.

Solid waste storage areas should be located at least 50 ft. from drainage facilities and watercourses and should not be located in area prone to flooding or ponding.

Inspection and Maintenance: Inspect construction waste area weekly.

Arrange for regular waste collection.

C1 - Description of pollutants and their sources associated with the proposed land use:

Leaves, mulch, vehicular sources such as leaking fuel or oil, brake fluid, brake dust, grease, antifreeze, metals, rubber fragments, road grit, salts and sands, trash and debris, fertilizers, cleaning agents chemicals, paint, animal waste, elevated storm runoff temperatures, pesticides and pathogens.

C2 - Description of proposed post-construction stormwater measures:

Aqua-Swirls
The Aqua-Swirl™Stormwater Treatment System is a custom engineered, post-construction flow-through water quality device designed to remove coarse sediment, debris and free floating oil by utilizing hydrodynamic separation technology.
Aqua-Swirl™technology is a modular high flow rate treatment system that has no moving parts and operates under gravity flow conditions within a single swirl chamber

Wet Detention Basin
They serve to control the volume and rate of runoff. The facility removes sediment, BOD organic nutrients and trace metals through the process of settling of pollutants. Biological processes occurring in the pond aid in reducing the amount of soluble nutrients present such as nitrate and phosphorus.

C3 - Plan details for each stormwater measures:
For details See Plan Set : Erosion Control Details, C500

C4 - Sequence describing stormwater measure implementation.
Reference Erosion Control Sequencing
See Plan Set : Initial and Final Erosion Control Plans, C400 - C405

Aquaswirl
This structure shall be constructed with the storm sewer system.
For Locations see Plan Set : Storm Sewer Plan and Profiles, C320
For details See Plan Set : Storm Sewer Details, C502

Wet Detention Basin
Wet Detention Basin will be initially excavated as part of mass grading of the site. It will be used throughout the construction phase to control sediment, then persist into the post construction phase as permanent features providing stormwater retention and sediment control.

C5 - Maintenance guidelines for proposed post-construction stormwater measures:

Aquaswirl
Each aquaswirl structure shall be completely inspected every 3 months on a regular basis. A truck that is specifically designed for stormwater structure maintenance shall be used. The Owner shall conduct the inspections and coordination of maintenance.

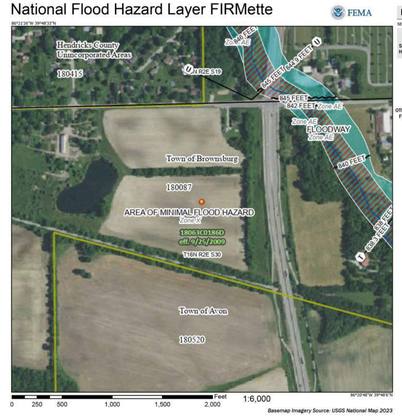
Permanent Seeding
Permanent seeding areas should be checked annually for issues related to performance. During this time plant seed if necessary and any erosion problems addressed. Trash should be removed on an as need basis. The grass should be kept to a 3" - 4" height. Maintenance is the responsibility of the Owner.

Wet Detention Basins (Ponds)
Inlets and outlets should be checked to make sure they are free of debris. The wet ponds should be checked semiannually to ensure proper performance. Banks should be checked for erosion, and repaired if necessary. Sediment should be removed from the pool when the accumulated sediment volume exceeds 20% of the basin volume. Maintenance shall be done by the Owner.

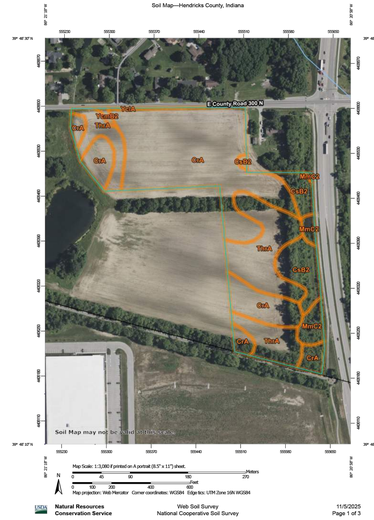
Streets
Street cleaning and trash collection shall be done by the Owner. Streets should be monitored monthly and swept as needed to remove as much sediment as possible before it reaches the grass waterway.

C6 - Entity that will be responsible for operation and maintenance of the post- construction stormwater measures:
R2 Corridor, LLC
9589 Valparaiso Ct.
Indianapolis, IN 46264
317-580-9693
Contact: Steve Pittman

National Flood Hazard Layer FIRMette



Soil Map—Hendricks County, Indiana



Map Unit Legend

Map Unit Symbol	Map Unit Name
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes
CsB2	Crosby-Miami silt loams, 2 to 4 percent slopes, eroded
MmC2	Miami silt loam, 6 to 12 percent slopes, eroded
ThrA	Treaty silty clay loam, 0 to 1 percent slopes
YclA	Crosby silt loam, fine-loamy subsoil-Urban land complex, 0 to 2 percent slopes
YcmB2	Crosby-Urban land-Miami silt loams complex, 2 to 4 percent slopes, eroded

EXAMPLE EVALUATION LOG SHEET

EVALUATION FOR CONSTRUCTION PROJECTS
A trained individual shall perform a written evaluation of the project site.
a. By the end of the next business day following each rainfall that exceeds 0.5".
b. A minimum of one (1) time per week

Project Name: _____
Name of Trained Individual: _____ Date of Inspection: _____
Is Evaluation following a rainfall? 0 yes 0 no If yes, date the rain stopped: _____ Inches: _____

No.	PROBLEM OR CONCERN	YES	NO	N/A
1.	Is the site information posted at the entrance?			
2.	Are all necessary permits obtained and special provisions being implemented?			
3.	Is a construction entrance installed? Is it effective? Is it enough?			
4.	Are public and private streets clean?			
5.	Are appropriate practices installed where stormwater leaves the site?			
6.	Is silt fence entrenched into the ground?			
7.	Is silt fence upright? Do fabric and stakes meet specifications? Is fabric is not too torn? Is silt fence terminated to higher ground? Is it properly joined at ends?			
8.	Are sediment basins and traps installed according to the plan? Are the pipes or rock spillway still functional?			
9.	Is the earthwork for erosion and sediment control practices properly graded, seeded and/or mulched?			
10.	Are diversions, swales, and/or waterbars installed to plan and protected?			
11.	Do perimeter practices have adequate capacity and do not need to be cleaned out?			
12.	Is inlet protection installed on all functional inlets? (not filter fabric under grate)			
13.	Are inlet protection measures installed so water does not flow under it?			
14.	Are the frame, cross-bracing and/or stakes adequate and meet specifications?			
15.	Is the fabric, straw, mulch and/or stone intact without holes or tears?			
16.	Are catch basin inset protection installed where required?			
17.	Has sediment been removed from the catch basin insert protection?			
18.	Has swales and ditches been stabilized or protected?			
19.	Are stormwater outlets adequately stabilized?			
20.	Has temporary stabilization of distributed ground been addressed?			
21.	Has all disturbed areas that will lie dormant for 7 days protected?			
22.	Has all protected dormant areas met a minimum 70% coverage?			
23.	Does growing vegetation have sufficient water and/or nutrients to grow?			
24.	Is permanent stabilization of disturbed ground progressing through the project?			
25.	Is final grading and stabilization progressing on completed areas?			
26.	Has the soil been properly prepared for seeding?			
27.	Has hard or soft armoring been installed where natural vegetation will erode?			
28.	Does water pumping operations have a protected outlet and is discharge water clear?			
29.	Has a designated washout been established for concrete trucks?			
30.	Is a dumpster located onsite for trash disposal?			
31.	Are onsite fuel tanks and other toxic materials safely stored and protected?			
32.	Are smaller construction sites not required to file a separate NOI complying with the overall plan?			

ALL PROBLEMS OR CONCERNS NEED TO BE ADDRESSED WITH A CORRECTIVE ACTION
Identify the problem by number and/or provide additional explanation as needed.

Developer Rep. contacted, name and date: _____ Date: _____
Contractor Rep. contacted, name and date: _____ Date: _____
Report submitted by: _____ Date: _____

Revisions | Date

Sym.

Designed: RRL/SJH
Drawn: SJH
Checked: RRL
Scale: NONE
Date: 01-23-2025

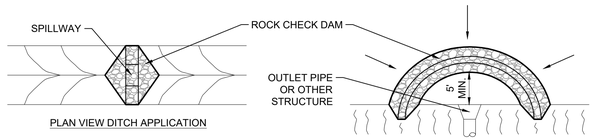
STORM WATER POLLUTION PREVENTION PLAN
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

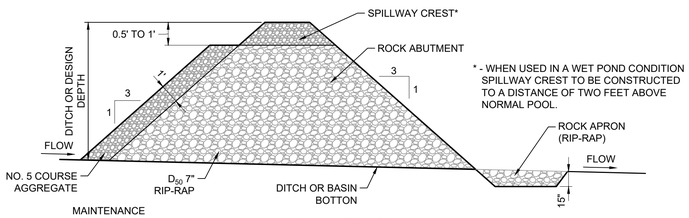
BANNING ENGINEERING
853 COLUMBIA ROAD SUITE #101
PLAINFIELD, IN 46168
BUS: (317) 707-3700 FAX: (317) 707-3800
E-MAIL: Banning@BanningEngineering.com
WEB www.BanningEngineering.com

Project No: 22370

Sheet No: C406

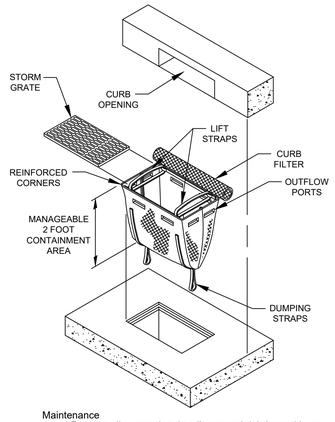
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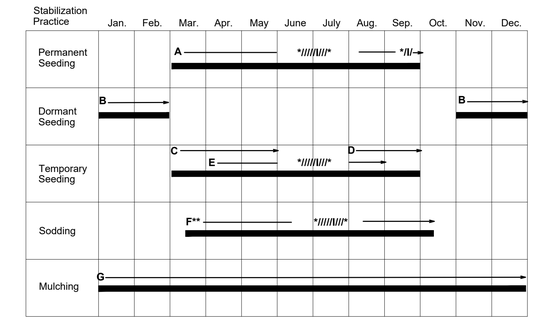
MAINTENANCE
·Inspect check dams and the channel weekly and after each 1/2" rainfall event and repair any damage immediately
·If significant erosion occurs between dams, install a riprap liner in that portion of the channel
·Remove sediment accumulated behind each dam as needed to maintain channel capacity, to allow drainage through the dam, and to prevent large flows from displacing sediment.
·Add rock to the dams as needed to maintain height and cross section.
·When dams are no longer needed, remove the riprap and aggregate and stabilize channel, using an erosion resistant lining if necessary. Riprap and aggregate fro the dam may be removed or utilized to stabilize the channel.
ROCK WASHED OUT-results in channel cutting; repair the washes and replace the rock

TEMPORARY ROCK CHECK DAM
NO SCALE



Maintenance
1. Remove all accumulated sediment and debris weekly or after each 1/2" rainfall event.
2. Remove sediment from bag after bag is 1/3 full.
3. If bag is damaged, remove bag and replace with new.

CURB SACK INLET PROTECTION
NO SCALE



A = Kentucky Bluegrass 40 lbs/acre; or 40 lbs. tall Fescue; plus 2 tons straw mulch/acre or add Annual Ryegrass 20 lbs/acre.

B = Kentucky Bluegrass 60 lbs/acre; or 40 lbs. tall Fescue; plus 2 tons straw mulch/acre or add Annual Ryegrass 30 lbs/acre.

C = Spring Oats 100 lbs./acre

D = Wheat or Rye 150 lbs./acre.

E = Annual Ryegrass 40 lbs/acre. (1 lb./1000 sq. ft.)

F = Sod

G = Straw Mulch 2 tons/acre.

// Irrigation needed during June, July, and/or September.

** Irrigation needed for 2 to 3 weeks after applying sod.

Lime and fertilize to site specific soils tests or apply fertilizer at a rate of 1000 lbs. per acre or 12-12-12 or equivalent.

All swales shall be seeded with 2 lbs. Adelphi bluegrass and 2 lbs. Perennial Derby rye, or equivalent per 1000 square feet. mulch with one bale of straw per 1000 square feet. Fertilize with 5 lbs. of 20-5-5 per 1000 square feet unless specified otherwise.

MAINTENANCE
Inspect weekly and after each 1/2" rainfall event, until the stand is successfully established. (Characteristics of a successful stand include: vigorous dark green or bluish-green seedlings; uniform density with nurse plants, legumes, and grasses well inter-mixed; green leaves; and the perennials remaining green throughout the summer, at least at the plant base.)

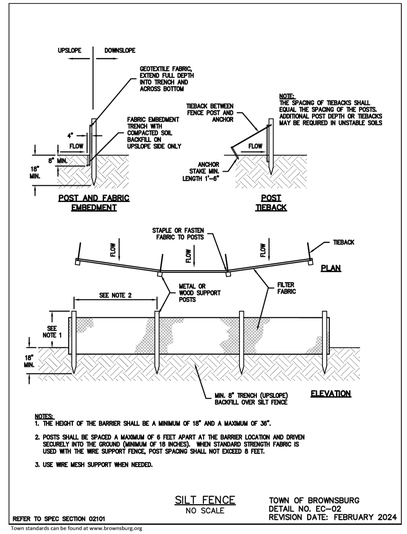
Plan to add fertilizer the following growing season according to soil test recommendations.

Repair damaged, bare, or sparse areas by filling any gullies, re-fertilizing, over- or re-seeding, and mulching.
If plant cover is sparse or patchy, review the plant materials chosen, soil fertility, moisture condition, and mulching; then repair the affected area either by over-seeding or by re-seeding and mulching after re-preparing the seedbed.

If vegetation fails to grow, consider soil testing to determine acidity or nutrient deficiency problems. (Contact your SWCD or Cooperative Extension office for assistance.)

If additional fertilization is needed to get a satisfactory stand, do so according to the soil test recommendations.

SEEDING CHART
NO SCALE

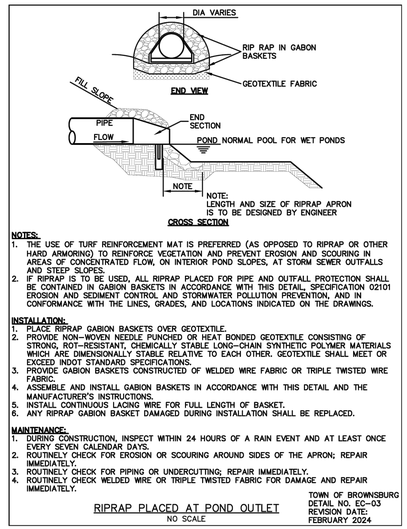


SILT FENCE
NO SCALE

TOWN OF BROWNSBURG
DETAIL NO. EC-02
REVISION DATE: FEBRUARY 2024

REFER TO SPEC SECTION 02101

Town standards can be found at www.brownsburg.org



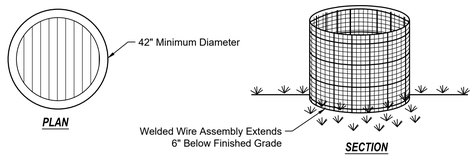
NOTES:
1. THE USE OF TURF REINFORCEMENT MAT IS PREFERRED (AS OPPOSED TO RIPRAP OR OTHER HARD ARMORING) TO REINFORCE VEGETATION AND PREVENT EROSION AND SCOURING IN AREAS OF CONCENTRATED FLOW, ON INTERIOR POND SLOPES, AT STORM SEWER OUTFALLS AND STEEP SLOPES.
2. IF RIPRAP IS TO BE USED, ALL RIPRAP PLACED FOR PIPE AND OUTFALL PROTECTION SHALL BE CONTAINED IN GABION BASKETS IN ACCORDANCE WITH THIS DETAIL, SPECIFICATION 02101 EROSION AND SEDIMENT CONTROL AND STORMWATER POLLUTION PREVENTION, AND IN CONFORMANCE WITH THE LINES, GRADES, AND LOCATIONS INDICATED ON THE DRAWINGS.

INSTALLATION:
1. PLACE RIPRAP GABION BASKETS OVER GEOTEXTILE.
2. PROVIDE NON-WOVEN NEEDLE PUNCHED OR HEAT BONDED GEOTEXTILE CONSISTING OF STRONG, ROT-RESISTANT, CHEMICALLY STABLE LONG-CHAIN SYNTHETIC POLYMER MATERIALS WHICH ARE DIMENSIONALLY STABLE RELATIVE TO EACH OTHER. GEOTEXTILE SHALL MEET OR EXCEED INDOT STANDARD SPECIFICATIONS.
3. PROVIDE GABION BASKETS CONSTRUCTED OF WELDED WIRE FABRIC OR TRIPLE TWISTED WIRE FABRIC.
4. ASSEMBLE AND INSTALL GABION BASKETS IN ACCORDANCE WITH THIS DETAIL AND THE MANUFACTURER'S INSTRUCTIONS.
5. INSTALL CONTINUOUS LACING WIRE FOR FULL LENGTH OF BASKET.
6. ANY RIPRAP GABION BASKET DAMAGED DURING INSTALLATION SHALL BE REPLACED.

MAINTENANCE:
1. DURING CONSTRUCTION, INSPECT WITHIN 24 HOURS OF A RAIN EVENT AND AT LEAST ONCE EVERY SEVEN CALENDAR DAYS.
2. ROUTINELY CHECK FOR EROSION OR SCOURING AROUND SIDES OF THE APRON; REPAIR IMMEDIATELY.
3. ROUTINELY CHECK FOR PIPING OR UNDERCUTTING; REPAIR IMMEDIATELY.
4. ROUTINELY CHECK WELDED WIRE OR TRIPLE TWISTED FABRIC FOR DAMAGE AND REPAIR IMMEDIATELY.

RIPRAP PLACED AT POND OUTLET
NO SCALE

TOWN OF BROWNSBURG
DETAIL NO. EC-03
REVISION DATE:
FEBRUARY 2024



NOTES:
Installation: 6" x 6" Welded Wire Mesh Shall Be Formed Of 10Ga Steel Conforming To ASTM A-185

Geotextile Shall Be Wrapped Three Inches Over The Top Member Of The 6" x 6" Welded Wire Mesh And Shall Be Secured With Fastening Rings Through Both Geotextile Layers And Close Around A Steel Member At Six Inches On Center Fastening Rings Shall Be Constructed Of Wire Conforming To ASTM A-641, A-809, A-370, And A-938.

Geotextile Shall Be Secured To The Sides Of Welded Wire Mesh With Fastening Rings At A Spacing Of One Per Square Foot Except For The Bottom 2-Inches Which Shall Extend Past The Welded Wire And Be Left Unsecured For Entrenchment.

Welded Wire Assembly Shall Be Formed Into A Minimum 42" Diameter Circle With a 3" Minimum Overlap On The Ends Secured By Wire Or Zip Ties.

Welded Wire Assembly Shall Then Be Placed In A 6" Deep Trench And Backfilled And Compacted Over The Geotextile Flap.

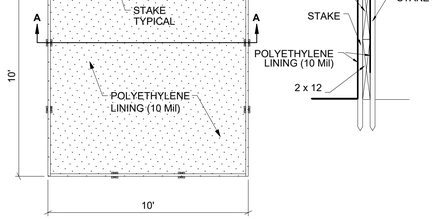
Maintenance: Inspect The Welded Wire Inlet Protector Weekly And After Each Rainfall Event.

If Geotextile Tears, Start To Decompose, Or In Any Way Becomes Ineffective, Replace The Affected Portion Immediately.

Remove The Deposited Sediment When It Reaches Half The Height Of The Structure At Its Lowest Point Or Is Causing The Structure To Shift Take Care To Avoid Undermining The Structure During Clean Out.

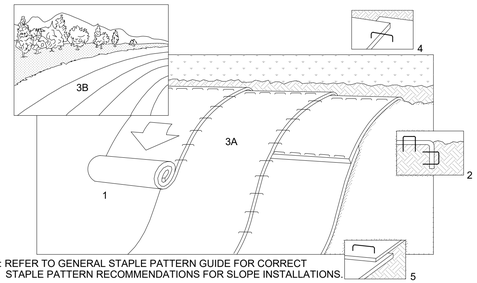
After The Contributing Drainage Area Has Been Stabilized, Remove The Structure And Sediment Deposits, Bring The Disturbed Area To Grade, And Stabilize.

WELDED WIRE INLET PROTECTION
NO SCALE



1. Concrete washout area shall be installed prior to any concrete placement on site.
2. Signs shall be placed at the construction entrance, at the washout area, and elsewhere as necessary to clearly indicate the location of the concrete washout area to all operators of concrete trucks.
3. The concrete washout area shall be repaired, enlarged, or cleaned out as necessary to maintain capacity for wasted concrete.
4. Upon the completion of construction, all wasted concrete shall be removed from the site and disposed of at an approved waste site.
5. When the concrete washout area is removed, the area shall be seeded and mulched or otherwise stabilized in a manner approved by the inspector.

CONCRETE WASHOUT ON GRADE
NO SCALE

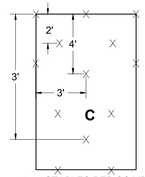


NOTE: REFER TO GENERAL STAPLE PATTERN GUIDE FOR CORRECT STAPLE PATTERN RECOMMENDATIONS FOR SLOPE INSTALLATIONS.

1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
3. ROLL THE BLANKETS (A) DOWN OR (B) HORIZONTALLY ACROSS THE SLOPE.
4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2" OVERLAP.
5. WHEN BLANKETS MUST BE SPLICED DOWN THE SLOPE, PLACE BLANKETS END OVER END (SHINGLE STYLE) WITH APPROXIMATELY 4" OVERLAP. STAPLE THROUGH OVERLAPPED AREA APPROXIMATELY 12" APART.

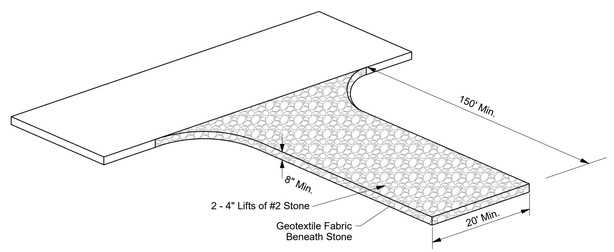
MAINTENANCE
*During vegetative establishment, inspect weekly & after each 1/2" rainfall event for any erosion below the blanket.
*If any area shows erosion, pull back that portion of the blanket covering it, add soil, re-seed the area, and re-lay and staple the blanket.
* After vegetative establishment, check the treated area periodically.

SLOPE INSTALLATION
NO SCALE



1.75 STAPLES PER SQ YD

STAPLE PATTERN GUIDE
NO SCALE



MAINTENANCE
*Inspect entrance pad and sediment disposal area weekly and after each 1/2" rainfall event or heavy use.
*Reshape pad as needed for drainage and runoff control.
*Topdress with clean stone as needed.
*Immediately remove mud and sediment tracked or washed onto public roads by brushing or sweeping. Flushing should only be used if the water is conveyed into a sediment trap or basin
*Repair any broken road pavement immediately.

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE / EXIT
NO SCALE

Revisions | Date

Sym.

Designed: RRL/SJH
Drawn: SJH
Checked: RRL
Scale: NONE
Date: 01-23-2025

EROSION CONTROL DETAILS
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

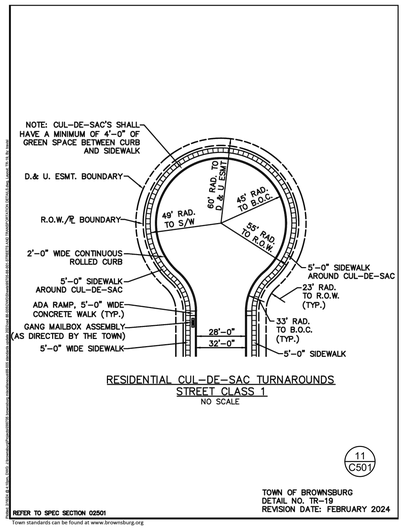
W. CHAD ZIEGLER REGISTERED No. PE11200667 STATE OF INDIANA PROFESSIONAL ENGINEER

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BUS: (317) 707-3700, FAX: (317) 707-3800
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WEB: www.BanningEngineering.com

Project No: 22370

Sheet No: C500

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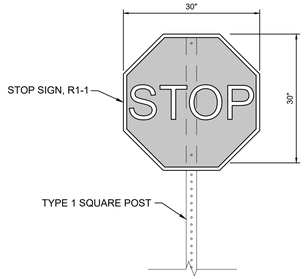
RESIDENTIAL CUL-DE-SAC TURNAROUNDS
STREET CLASS 1
NO SCALE

11 C501

TOWN OF BROWNSBURG
DETAIL NO. TR-19
REVISION DATE: FEBRUARY 2024

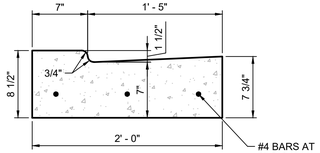
REFER TO SPEC SECTION 02501

Town standards can be found at www.brownsburg.org



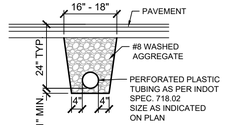
STOP SIGN
NO SCALE

7 C501



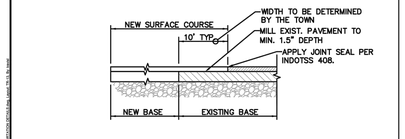
REINFORCED CONCRETE GUTTER
NO SCALE

8 C501



SUB-DRAIN TRENCH UNDER PAVEMENT
NO SCALE

9 C501



CONNECTION TO EXISTING STREETS
NO SCALE

NOTE:

THIS DETAIL SHALL BE USED FOR CONNECTING TO THE END OF AN EXISTING STREET.

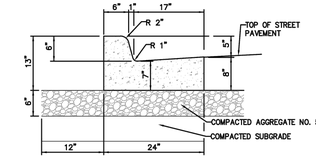
EXISTING PAVEMENT SHALL BE SAW CUT, FULL DEPTH, AT A UNIFORM LOCATION INSIDE OF THE EXISTING EDGE OF PAVEMENT, WHERE THE PAVEMENT IS IN GOOD CONDITION AND WILL PROVIDE AN INTERFACE WITH THE FULL PAVEMENT SECTION LINE AND GRADE, FREE FROM LOOSE, DAMAGED, DETERIORATED OR OTHERWISE COMPROMISED MATERIAL; A MINIMUM OF SIX (6) INCHES FROM THE EXISTING EDGE OF PAVEMENT FOR THE FULL WIDTH OF THE EXISTING PAVEMENT; LOCATION OF SAW-CUT TO BE DETERMINED BY THE TOWN OF BROWNSBURG. THE ENTIRE AREA OF THE PROPOSED INTERFACE SHALL BE EXCAVATED TO THE PROPOSED SUBGRADE ELEVATION. THE SUBGRADE SHALL BE STABILIZED IN ACCORDANCE WITH TOWN OF BROWNSBURG STANDARDS AND SPECIFICATIONS. AFTER THE SUBGRADE HAS BEEN STABILIZED AND APPROVED, EXISTING HMA PAVEMENT WILL BE SURFACE MILLED 10 FEET ALONG THE NEW SAW-CUT END OF PAVEMENT TO PROVIDE A WATER STOP AND SMOOTH TRANSITION TO THE NEW PAVEMENT WHEN THE SURFACE MIX IS APPLIED. THE NEW PAVEMENT SECTION SHALL BE INSTALLED IN ACCORDANCE WITH TOWN STANDARDS AND SPECIFICATIONS.

4 C501

TOWN OF BROWNSBURG
DETAIL NO. TR-13
REVISION DATE: FEBRUARY 2024

REFER TO SPEC SECTION 02500, 02502, 02504

Town standards can be found at www.brownsburg.org



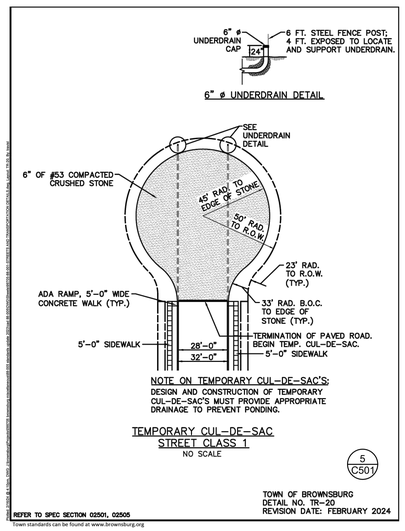
CONCRETE CHAIR BACK CURB & GUTTER
NO SCALE

1 C501

TOWN OF BROWNSBURG
DETAIL NO. TR-01
REVISION DATE: FEBRUARY 2024

REFER TO SPEC SECTION 02500, 02501, 02502, 02504

Town standards can be found at www.brownsburg.org



NOTE ON TEMPORARY CUL-DE-SAC'S:
DESIGN AND CONSTRUCTION OF TEMPORARY CUL-DE-SAC'S MUST PROVIDE APPROPRIATE DRAINAGE TO PREVENT PONDING.

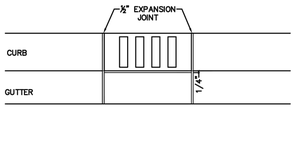
TEMPORARY CUL-DE-SAC
STREET CLASS 1
NO SCALE

5 C501

TOWN OF BROWNSBURG
DETAIL NO. TR-20
REVISION DATE: FEBRUARY 2024

REFER TO SPEC SECTION 02501, 02505

Town standards can be found at www.brownsburg.org



CURB INLET DETAIL
NO SCALE

NOTE:

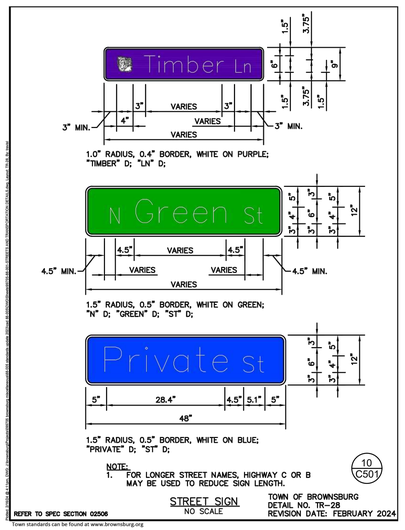
INLET FLOW LINE SHALL BE INSTALLED 1/4 IN. BELOW ADJACENT GUTTER FLOWLINES.

2 C501

TOWN OF BROWNSBURG
DETAIL NO. TR-04
REVISION DATE: FEBRUARY 2024

REFER TO SPEC SECTION 02500, 02502, 02504

Town standards can be found at www.brownsburg.org



NOTE:
1. FOR LONGER STREET NAMES, HIGHWAY C OR B MAY BE USED TO REDUCE SIGN LENGTH.

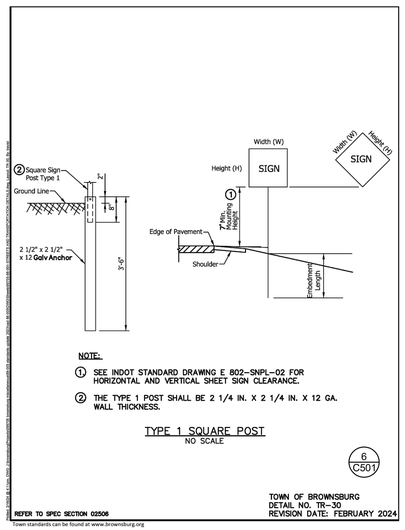
STREET SIGN
NO SCALE

10 C501

TOWN OF BROWNSBURG
DETAIL NO. TR-28
REVISION DATE: FEBRUARY 2024

REFER TO SPEC SECTION 02506

Town standards can be found at www.brownsburg.org



NOTE:

1. SEE INDOT STANDARD DRAWING E 802-SNPL-02 FOR HORIZONTAL AND VERTICAL SHEET SIGN CLEARANCE.
2. THE TYPE 1 POST SHALL BE 2 1/4 IN. X 2 1/4 IN. X 12 GA. WALL THICKNESS.

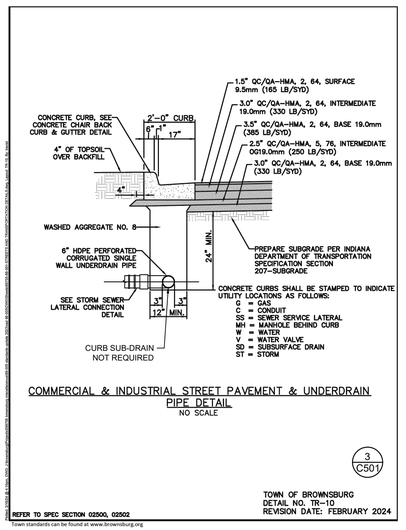
TYPE 1 SQUARE POST
NO SCALE

6 C501

TOWN OF BROWNSBURG
DETAIL NO. TR-30
REVISION DATE: FEBRUARY 2024

REFER TO SPEC SECTION 02506

Town standards can be found at www.brownsburg.org



COMMERCIAL & INDUSTRIAL STREET PAVEMENT & UNDERDRAIN PIPE DETAIL
NO SCALE

3 C501

TOWN OF BROWNSBURG
DETAIL NO. TR-10
REVISION DATE: FEBRUARY 2024

REFER TO SPEC SECTION 02500, 02502

Town standards can be found at www.brownsburg.org

MISCELLANEOUS DETAILS
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

Revisions | Sym. | Date

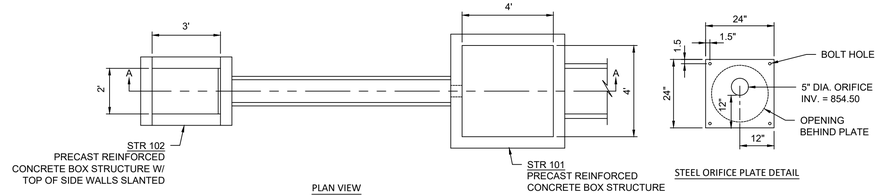
Designed: RRL/SJH
Drawn: SJH
Checked: RRL
Scale: NONE
Date: 01-23-2025

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653 COLUMBIA ROAD, SUITE #101
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W. CHAD ZIEGLER
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No. PE11200667
STATE OF INDIANA
PROFESSIONAL ENGINEER

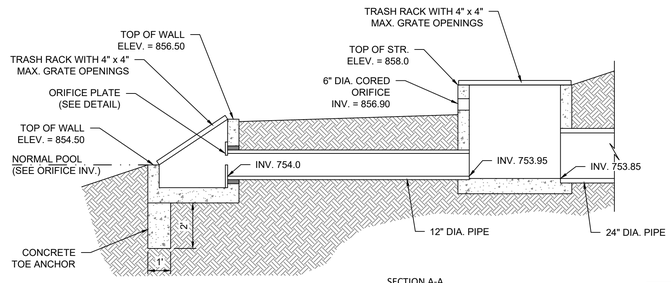
Project No: 22370
Sheet No: C501

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PLAN VIEW

STEEL ORIFICE PLATE DETAIL



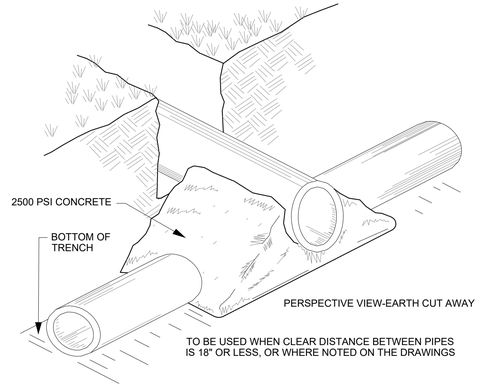
SECTION A-A

GENERAL NOTES:

1. CONTRACTOR SHALL SUBMIT A CERTIFIED STRUCTURAL DESIGN OF THE BOX STRUCTURES FOR ENGINEER REVIEW
2. ALL STEEL MATERIAL SHALL BE STAINLESS OR GALVANIZED.
3. STEEL PLATE WITH ORIFICE SHALL BE 1/4 INCH THICK MIN., AND SHALL BE BOLTED TO CONCRETE WITH MIN. 1/4 INCH DIA. ANCHORS.
4. A WATERPROOF SILICONE SEALANT SHALL BE USED BETWEEN THE STAINLESS STEEL PLATE AND CONCRETE SURFACE.
5. CONTRACTOR SHALL SUBMIT A DRAWING OF TRASH RACKS SELECTED FOR ENGINEER REVIEW

POND OUTLET DETAIL

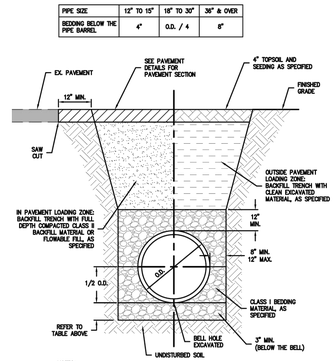
NO SCALE



CONCRETE CRADLE

NO SCALE

PIPE SIZE	12" TO 15"	18" TO 30"	36" & OVER
BEDDING BELOW THE PIPE BARREL	4"	O.D. / 4	8"



NOTES:
1. INSTALLATION OF FLEXIBLE PIPE SHALL BE IN ACCORDANCE WITH ASTM D2321.
2. FLEXIBLE PIPE MATERIALS FOR STORM SEWERS INCLUDE HIGH DENSITY POLYETHYLENE (HDPE), POLYPROPYLENE, AND POLYVINYL CHLORIDE (PVC) PIPE.
3. FLEXIBLE PIPE MATERIALS FOR SANITARY SEWERS INCLUDE POLYVINYL CHLORIDE (PVC) PIPE.
4. PAVEMENT LOADING ZONE IS THE AREA WITHIN 5 FEET OF ANY EDGE OF PAVEMENT, CURB, GUTTER, SIDEWALK OR SIMILAR STRUCTURE.

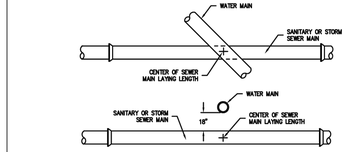
FLEXIBLE GRAVITY PIPE TRENCH

NO SCALE

REFER TO SPEC SECTION 02220

TOWN OF BROWNSBURG
DETAIL NO. GT-04
REVISION DATE: FEBRUARY 2024

Town standards can be found at www.brownsburg.org



NOTES:
1. WATER MAIN AND SEWER MINIMUM SEPARATION: 18" VERTICAL SEPARATION 10'-0" HORIZONTAL SEPARATION.

MINIMUM CROSSOVER AND SEPARATION REQUIREMENTS FOR SEWER & WATER MAINS

NO SCALE

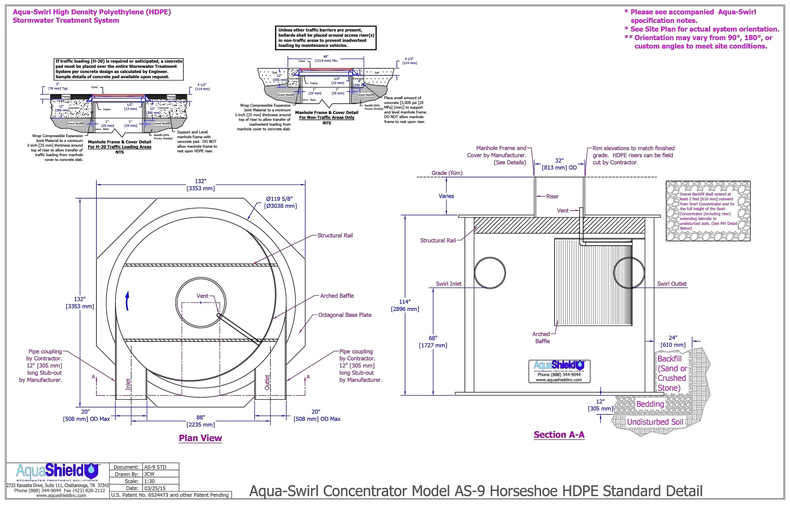
REFER TO SPEC SECTION 02860, 02720, 02730

TOWN OF BROWNSBURG
DETAIL NO. GE-02
REVISION DATE: FEBRUARY 2024

Town standards can be found at www.brownsburg.org

Aqua-Swirl High Density Polyethylene (HDPE) Stormwater Treatment System

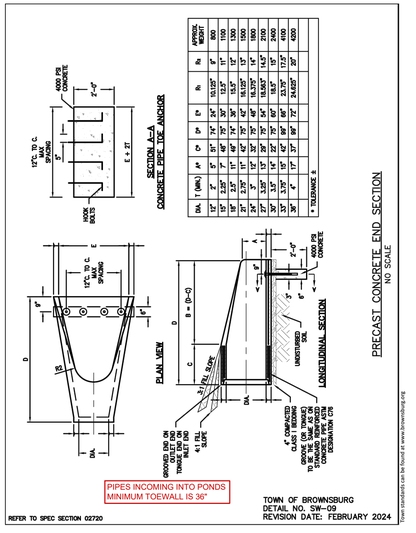
*** Please see accompanied Aqua-Swirl specification notes.**
*** See Site Plan for actual system orientation.**
**** Orientation may vary from 90°, 180°, or custom angles to meet site conditions.**



Document:	AS-9 STD
Drawn By:	JCW
Scale:	1:30
Date:	03/25/15

AquaShield
2272 Kanawha Drive, Suite 111, Charleston, TN 37310
Phone (888) 344-9049 Fax (423) 626-2112
www.aquashieldinc.com
U.S. Patent No. 6524473 and other Patent Pending

Aqua-Swirl Concentrator Model AS-9 Horseshoe HDPE Standard Detail

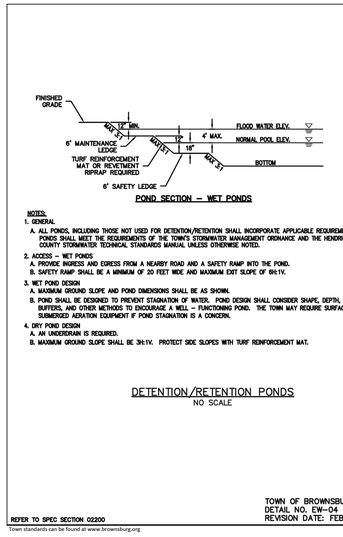


PIPES INCOMING INTO PONDS MINIMUM TOEWALL IS 36"

REFER TO SPEC SECTION 02720

TOWN OF BROWNSBURG
DETAIL NO. SW-09
REVISION DATE: FEBRUARY 2024

Town standards can be found at www.brownsburg.org



POND SECTION – WET PONDS

NOTES:
1. GENERAL
   A. ALL PONDS, INCLUDING THOSE NOT USED FOR DETENTION/RETENTION SHALL INCORPORATE APPLICABLE REQUIREMENTS BELOW. PONDS SHALL MEET THE REQUIREMENTS OF THE TOWN'S STORMWATER MANAGEMENT ORDINANCE AND THE HENDRICKS COUNTY STORMWATER TECHNICAL STANDARDS MANUAL UNLESS OTHERWISE NOTED.
2. ACCESS – WET PONDS
   A. PROVIDE INGRESS AND EGRESS FROM A NEARBY ROAD AND A SAFETY RAMP INTO THE POND.
   B. SAFETY RAMP SHALL BE A MINIMUM OF 20 FEET WIDE AND MAXIMUM EXIT SLOPE OF 6H:1V.
3. WET POND DESIGN
   A. MAXIMUM GROUND SLOPE AND POND DIMENSIONS SHALL BE AS SHOWN.
   B. POND SHALL BE DESIGNED TO PREVENT STAGNATION OF WATER. POND DESIGN SHALL CONSIDER SHAPE, DEPTH, VEGETATIVE BUFFERS, AND OTHER METHODS TO ENCOURAGE A WELL – FUNCTIONING POND. THE TOWN MAY REQUIRE SURFACE OR SUBMERGED AERATION EQUIPMENT IF POND STAGNATION IS A CONCERN.
4. DRY POND DESIGN
   A. AN UNDERDRAIN IS REQUIRED.
   B. MAXIMUM GROUND SLOPE SHALL BE 3H:1V. PROTECT SIDE SLOPES WITH TURF REINFORCEMENT MAT.

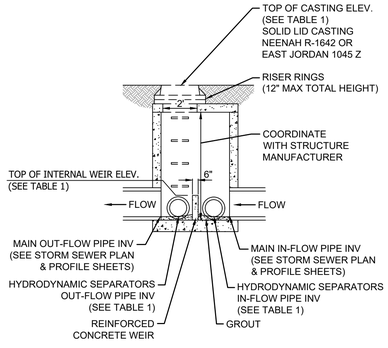
DETENTION/RETENTION PONDS

NO SCALE

REFER TO SPEC SECTION 02200

TOWN OF BROWNSBURG
DETAIL NO. EW-04
REVISION DATE: FEBRUARY 2024

Town standards can be found at www.brownsburg.org



DIVERSION STRUCTURE
SECTION S-S

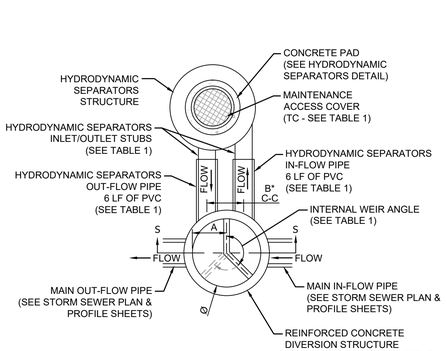


TABLE 1

DIVERSION STRUCTURE							HYDRODYNAMIC SEPARATORS						
STRUCTURE NUMBER	DIMENSIONS (ft.)			TOP OF INTERNAL WEIR ELEVATION	INTERNAL WEIR ANGLE	TOP OF CASTING ELEVATION	STRUCTURE NUMBER	INLET/OUTLET STUB INV ELEVATION	CALCULATED TREATMENT FLOW REQUIRED (CFS)	TOP OF CASTING ELEVATION	IN-FLOW / OUT-FLOW PIPES		
	Ø	A	B*								DIA (in.)	INVERT ELEV. AT DIVERSION STR	
												IN-FLOW PIPE	OUT-FLOW PIPE
DIV1	8	4	4	857.65	180°	863.27	WQ1	855.60	14.2	862.00	24	855.65	855.55

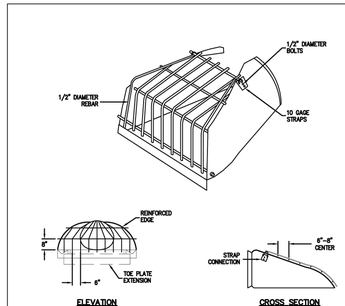
*COORDINATE WITH HYDRODYNAMIC SEPARATOR MANUFACTURER AND CONTACT ENGINEER IF CHANGE IS REQUIRED
**EQUIVALENT HYDRODYNAMIC STRUCTURES CAN BE USED PROVIDED THEY MEET PROJECT REQUIREMENTS AND THE CALCULATED TREATMENT FLOW RATE

GENERAL NOTES:

1. CONTRACTOR SHALL SUBMIT MANUFACTURER'S SHOP DRAWINGS FOR BOTH THE DIVERSION STRUCTURE AND HYDRODYNAMIC SEPARATORS STRUCTURE FOR ENGINEER REVIEW.

OFFLINE HYDRODYNAMIC AND DIVERSION STRUCTURE TYPICAL DETAIL

NO SCALE



ELEVATION

CROSS SECTION

NOTES:
1. TRASH RACK BARS TO BE BLACK STEEL.
2. PAINT WITH HIGH ZINC COATING AFTER FABRICATION.
3. PLANT FIT TRASH RACK CONFIGURATION.
4. BOLT THROUGH BOTTOM SECTION WITH NUT.
5. LAY OPEN ON BOTTOM FOR "HINGE" EFFECT.
6. LAST CROSS BAR THROUGH BOTTOM SECTION.
7. DETAIL APPLIES TO PIPES 18" AND LARGER AND ARE REQUIRED ON INLETS AND OUTLETS (BOTH ENDS OF THE PIPE) FOR CULVERT PIPES.

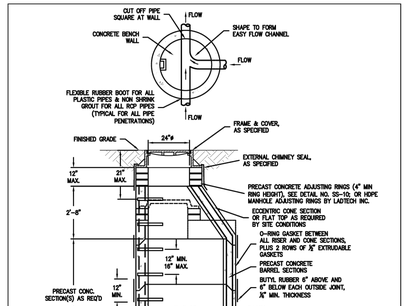
TRASH GUARD

NO SCALE

REFER TO SPEC SECTION 02720

TOWN OF BROWNSBURG
DETAIL NO. SW-10
REVISION DATE: FEBRUARY 2024

Town standards can be found at www.brownsburg.org



NOTES:
1. PROVIDE GRATE CASTING WITH A POLLUTION PREVENTION MESSAGE AND ICON WHICH ARE PERMANENTLY ATTACHED OR CAST DIRECTLY INTO THE CASTING. THE CASTING SHALL HAVE THE MESSAGE "DUMP NO WASTE -FISH ICON- DRAINS TO WATERWAY" IN MINIMUM 1 INCH HIGH LETTERS.
2. INSTALL CASTING ¾" BELOW FINISHED PAVEMENT ELEVATION.

STANDARD STORM MANHOLE

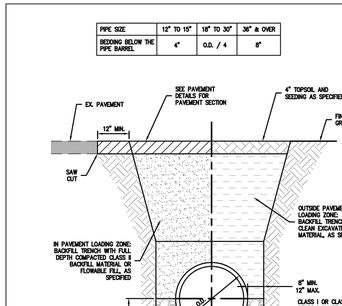
NO SCALE

REFER TO SPEC SECTION 02720

TOWN OF BROWNSBURG
DETAIL NO. SW-11
REVISION DATE: FEBRUARY 2024

Town standards can be found at www.brownsburg.org

PIPE SIZE	12" TO 15"	18" TO 30"	36" & OVER
BEDDING BELOW THE PIPE BARREL	4"	O.D. / 4	8"



NOTES:
1. RIGID PIPE MATERIALS FOR STORM SEWERS INCLUDE DUCTILE IRON AND REINFORCED CONCRETE PIPE (RCP).
2. RIGID PIPE MATERIALS FOR SANITARY SEWERS INCLUDE DUCTILE IRON PIPE.
3. PAVEMENT LOADING ZONE IS THE AREA WITHIN 5 FEET OF ANY EDGE OF PAVEMENT, CURB, GUTTER, SIDEWALK OR SIMILAR STRUCTURE.

RIGID GRAVITY PIPE TRENCH

NO SCALE

REFER TO SPEC SECTION 02220

TOWN OF BROWNSBURG
DETAIL NO. GT-02
REVISION DATE: FEBRUARY 2024

Town standards can be found at www.brownsburg.org

STORM SEWER DETAILS
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA

Sym.	Revisions	Date

Designed: RRL/SJH
Drawn: SJH
Checked: RRL
Scale: NONE
Date: 01-23-2025

W. CHAD ZIEGLER
REGISTERED
No. PE11200667
STATE OF INDIANA
PROFESSIONAL ENGINEER

BANNING ENGINEERING
853 COLUMBIA ROAD SUITE #101
PLAINFIELD, IN 46168
BUS: (317) 707-3700 FAX: (317) 707-3800
E-MAIL: Banning@BanningEngineering.com
WEB: www.BanningEngineering.com

Project No: 22370

Sheet No: C502

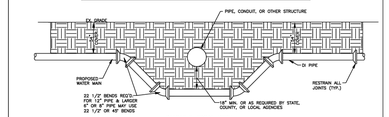
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CITIZENS WATER
STANDARD PRACTICE **H.2**

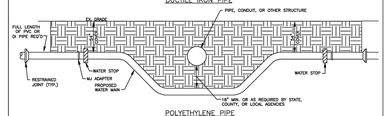
REVISION DATE: 11/22/2022 ISSUE DATE: 12/31/2019

WATER MAIN LOWERING

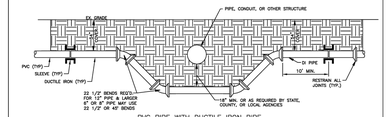
NOTES:
1. ALL PIPE USED IN WATER MAIN LOWERING SHALL BE POLYETHYLENE PIPE OR DUCTILE IRON WITH RESTRAINED BENDS. (SEE STANDARD PRACTICE DRAWING "O" FOR RESTRAINED JOINT)
2. DEFLECTIONS AND FITTINGS (INCLUDING TAPS) WITHIN A LOWERING SHALL BE PROHIBITED.



DUCTILE IRON PIPE



POLYETHYLENE PIPE



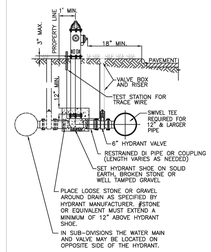
PVC PIPE WITH DUCTILE IRON PIPE

CITIZENS WATER
STANDARD PRACTICE **B**

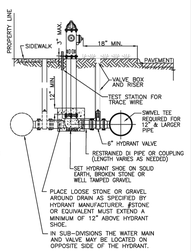
REVISION DATE: 10/02/2019 ISSUE DATE: 12/31/2019

STANDARD HYDRANT SETTING

NOTES:
1. ALL HYDRANTS SHALL BE RESTRAINED TO THE HYDRANT TEE WITH DUCTILE IRON BRANCH PIPING ENCASED IN POLYETHYLENE WRAP.
2. SWIVEL 90° BEND MAY BE USED TO INSTALL HYDRANT AND VALVE IN GRASS STRIP BETWEEN CURB & SIDEWALK.
3. A MANUFACTURED "OUT OF SERVICE" SIGN WILL BE REQUIRED ON HYDRANTS UNTIL MAIN HAS BEEN PLACED "IN SERVICE" BY THE INSPECTOR.
4. FOR BRANCH PIPE LONGER THAN 10', INSTALL TRACING WIRE ALONG HYDRANT VALVE RISER.



SECTION VIEW
(WITHOUT SIDEWALK)



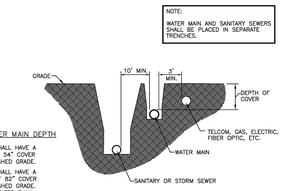
SECTION VIEW
(WITH SIDEWALK)

CITIZENS WATER
STANDARD PRACTICE **A**

REVISION DATE: 09/29/2021 ISSUE DATE: 6/8/2009

WATER MAIN SEPARATION FROM OTHER UTILITIES

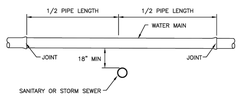
NOTE:
WATER MAIN AND SANITARY SEWERS SHALL BE PLACED IN SEPARATE TRENCHES.



WATER MAIN LAYING PARALLEL TO OTHER UTILITIES SECTION VIEW

TYPICAL WATER MAIN DEPTH

1. ALL PIPE SHALL HAVE A MINIMUM OF 54" COVER BELOW FINISHED GRADE.
2. ALL PIPE SHALL HAVE A MAXIMUM OF 82" COVER BELOW FINISHED GRADE. DEPTHS GREATER THAN 82" COVER WILL REQUIRE A LOWERING



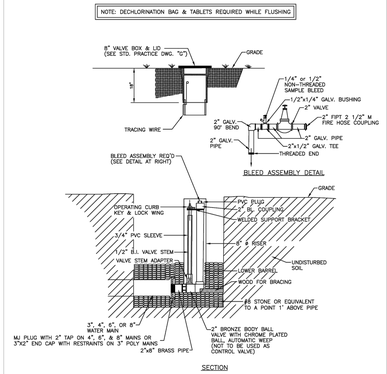
WATER MAIN CROSSING SEWER SECTION VIEW

CITIZENS WATER
STANDARD PRACTICE **J**

REVISION DATE: 11/21/2022 ISSUE DATE: 6/8/2009

2" BLOW-OFF ASSEMBLY FOR 3" THROUGH 8" MAIN

NOTE: DECHLORINATION BAG & TABLETS REQUIRED WHILE FLUSHING



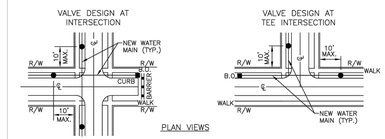
BLEED ASSEMBLY DETAIL

SECTION

CITIZENS WATER
STANDARD PRACTICE **F**

REVISION DATE: 10/20/2020 ISSUE DATE: 6/8/2009

TYPICAL VALVE PLACEMENT



PLAN VIEWS

CONTINUOUS RUNS
VALVE SEPARATION: 6" THROUGH 12" VALVES, INSTALLATION EVERY 1000' TO 1200'
16" THROUGH 24" VALVES, INSTALLATION EVERY 1200' TO 1800'
30" OR LARGER VALVES, MAXIMUM 1800'

FOR LARGER MAINS THE VALVE SEPARATION MAY BE REDUCED WITHIN A DEVELOPMENT, AS APPROVED BY THE UTILITY.

PLAN VIEW

NOTES:
SEE SEC. 2.03-C FOR VALVE INSTALLATION INFORMATION

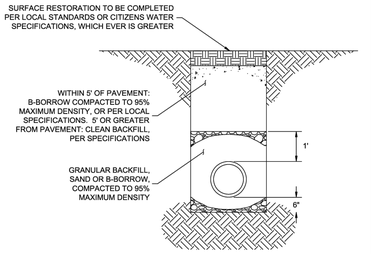
SEE SEC. 7.05 FOR VALVE OPENING INFORMATION

NOTE:
ALL VALVES ARE TO BE INSTALLED WITHIN 10' OF AN INTERSECTION OR NEAR A FIRE HYDRANT.

CITIZENS WATER
STANDARD PRACTICE **A.1**

REVISION DATE: 9/20/2018 ISSUE DATE: 7/17/2013

WATER MAIN AND SERVICE BACKFILL REQUIREMENTS



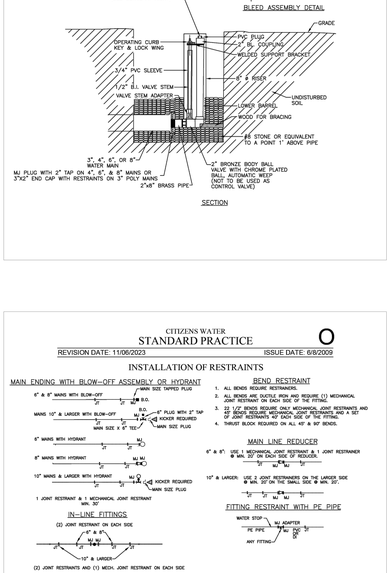
SCALE: NTS

NOTE:
COMPACTED BACKFILL IN LIFTS OF 12" MAXIMUM. TRENCH EXCAVATION SHALL CONFORM TO LOCAL STANDARDS.

CITIZENS WATER
STANDARD PRACTICE **O**

REVISION DATE: 11/06/2023 ISSUE DATE: 6/8/2009

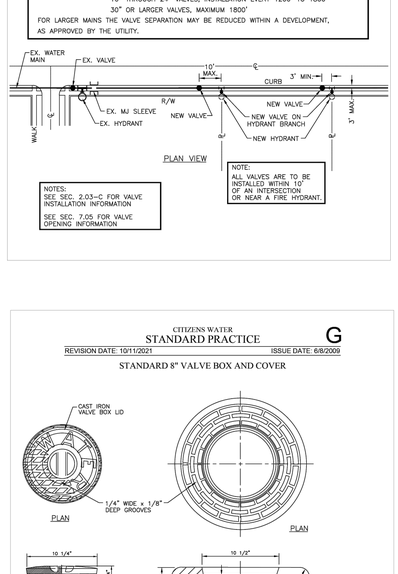
INSTALLATION OF RESTRAINTS



CITIZENS WATER
STANDARD PRACTICE **G**

REVISION DATE: 10/11/2021 ISSUE DATE: 6/8/2009

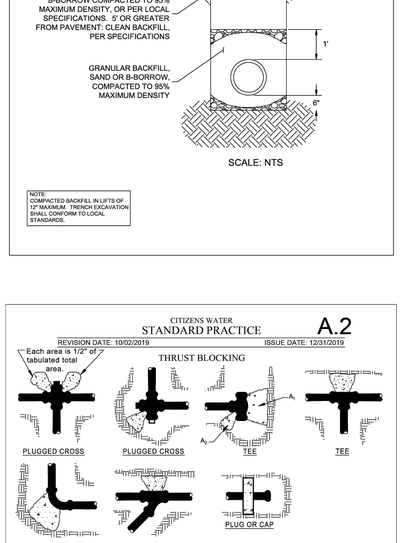
STANDARD 8" VALVE BOX AND COVER



CITIZENS WATER
STANDARD PRACTICE **A.2**

REVISION DATE: 10/02/2019 ISSUE DATE: 12/31/2019

THRUST BLOCKING



Notes:
1) CONCRETE THRUST BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
2) KEEP CONCRETE CLEAR OF JOINT AND ACCESSORIES.
3) POLYETHYLENE ENCASEMENT SHALL BE PLACED BETWEEN CONCRETE AND FITTINGS.
4) ALL POURED IN PLACE CONCRETE SHALL HAVE A 28 DAY STRENGTH OF 3,000 P.S.I., 2" TO 4" SLUMP AND INCLUDE WIRE MESH FOR REINFORCEMENT.
5) MINIMUM SOIL BEARING SURFACE AREA REQUIREMENTS ARE PROVIDED BELOW BASED ON 150 P.S.I. WATER PRESSURE PLUS 100 P.S.I. WATER HAMMER AND SOIL BEARING CAPACITY OF 3,000 POUNDS PER SQUARE FOOT.

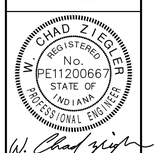
Minimum Soil Bearing Surface Area (ft2) (Assuming 3,000 psf Soil Bearing Capacity)				
Pipe Size	Horizontal Bends			Tee or Dead End (Plug/Cap)
	22-1/2°	45°	90°	
6"		6	8	6
8"		6	8	6
12"	4	6	11	8
16"	6	11	22	15
20"	9	18	36	24
24"	13	27	50	36
30"	20	45	76	57
36"	31	59	115	80

Revisions	Date

Sym.	

Designed:	RRL/SJH
Drawn:	SJH
Checked:	RRL
Scale:	NONE
Date:	01-23-2025

WATER MAIN DETAILS
RESERVE AT RONALD REAGAN
INFRASTRUCTURE PHASE 1
BROWNSBURG, INDIANA



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Project No: 22370

Sheet No: C503

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HENDRICKS COUNTY REGIONAL SEWER DISTRICT

HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

STANDARD DETAILS

DIRECTIONS FOR USE

1. THE ENTIRE SET OF FULL SIZE STANDARDS SHALL BE ATTACHED TO THE CONSTRUCTION DRAWINGS AND SHALL BE CONSIDERED PART THERETO. PARTIAL SET MAY BE USED FOR SMALL PROJECTS WHEN APPROVED BY *HENDRICKS COUNTY REGIONAL SEWER DISTRICT*.
2. DETAILS PREPARED BY OUTSIDE SOURCES SHALL NOT BE INCLUDED IN THE CONSTRUCTION DRAWINGS WHEN SAID DETAILS COVER WORK WHICH IS COVERED BY *HENDRICKS COUNTY REGIONAL SEWER DISTRICT* STANDARDS.
3. INDIVIDUAL *HENDRICKS COUNTY REGIONAL SEWER DISTRICT* STANDARDS THAT DO NOT APPLY MAY BE CROSSED OUT BY DESIGN ENGINEER THROUGH THE PLACEMENT OF A SINGLE LARGE X OVER DETAIL. MINOR REFERENCE NOTATIONS MAY BE PLACED ADJACENT TO INDIVIDUAL STANDARD TITLES FOR COORDINATION. HOWEVER, THE STANDARDS THEMSELVES SHALL NOT BE MODIFIED IN ANY WAY.
4. DETAILS PREPARED BY OUTSIDE SOURCES COVERING WORK WHICH IS NOT COVERED BY *HENDRICKS COUNTY REGIONAL SEWER DISTRICT* STANDARDS ARE THE SOLE RESPONSIBILITY OF THE DESIGN ENGINEER AND SHALL BE PLACED ON SHEETS OTHER THAN THE *HENDRICKS COUNTY REGIONAL SEWER DISTRICT* STANDARDS SHEETS.

GENERAL NOTES

1. CONTRACTOR SHALL VERIFY THE EXACT LOCATION OF ALL EXISTING UTILITIES AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION OR EXCAVATION. DURING CONSTRUCTION ALL UTILITIES SHALL BE ADEQUATELY SUPPORTED TO MINIMIZE DAMAGE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING OR REPLACING DAMAGED UTILITIES TO THE SATISFACTION OF *HENDRICKS COUNTY REGIONAL SEWER DISTRICT* AND THE OWNER OF THE AFFECTED UTILITY.
2. INSTALLATION OF OR PROVISIONS FOR THE INSTALLATION OF ALL UNDERGROUND UTILITIES INCLUDING SERVICE LATERALS TO BE PLACED UNDER PAVEMENT AREAS SHALL BE ESTABLISHED PRIOR TO THE CONSTRUCTION OF THE PAVEMENTS.
3. CONTRACTOR SHALL CONTACT *HENDRICKS COUNTY REGIONAL SEWER DISTRICT* FOR ELECTRICAL STANDARDS, TERMS, AND CONDITIONS DURING PROJECT PLANNING AND AT LEAST 1 MONTH PRIOR TO CONSTRUCTION OR EXCAVATION.

DRAWING INDEX

SHEET NO.	DESCRIPTION
01	STANDARD DETAILS
02	STANDARD DETAILS
03	STANDARD DETAILS
04	STANDARD DETAILS
04–A	STANDARD DETAILS
05	STANDARD DETAILS
06	LOW PRESSURE SEWER STANDARD DETAILS
	SANITARY SEWER SPECIFICATIONS
01	STANDARD SANITARY SEWER SPECIFICATIONS
02	STANDARD SANITARY SEWER SPECIFICATIONS
03	STANDARD SANITARY SEWER SPECIFICATIONS
	LIFT STATION SPECIFICATIONS
01	STANDARD LIFT STATION SPECIFICATIONS
02	STANDARD LIFT STATION SPECIFICATIONS
	LOW PRESSURE SEWER SPECIFICATIONS
01	STANDARD LOW PRESSURE SEWER SPECIFICATIONS
02	STANDARD LOW PRESSURE SEWER SPECIFICATIONS

REVISIONS

REVISION NO.	DESCRIPTION	DATE
1	SHEET ADDED	12/10/2018
3	REVISIONS TO AIR RELEASE VALVE LATERAL CONNECTION TO EXISTING SEWER	01/03/2019
4	DETAIL AND LIFT STATION SPECIFICATIONS UPDATES	01/21/2021
	SPECIFICATIONS	
1	UPDATED TESTING REQ. PER IDEM COMMENTS	01/20/2017
2	UPDATED TESTING REQ. PER IDEM COMMENTS	12/10/2018
3	GENERAL REVISIONS	01/03/2019
4	ASTM REFERENCE	08/05/2019

APPROVED BY

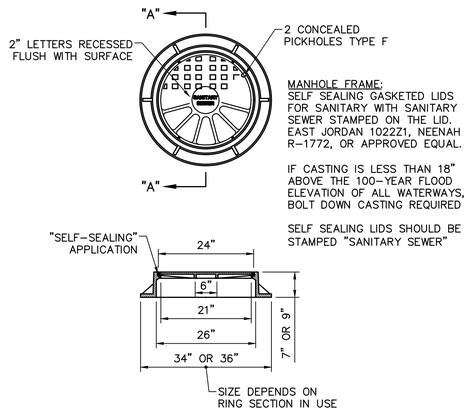
KAREN C. SAAVEDRA REGISTERED No. PE11500679 STATE OF INDIANA PROFESSIONAL ENGINEER

4/30/2021
KAREN C. SAAVEDRA
PROFESSIONAL ENGINEER No. PE11500679
STATE OF INDIANA

DATE OF ISSUANCE: 4/30/2021

811 Know what's below. Call before you dig.

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PLOT SCALE: 1:1
EDIT DATE: 5/3/2021
EDITED BY: PTRAWINSKI
DRAWING FILE: P:\IN2000\0103\D Drawings\Standards\2021 - HCRSD\HCRSD - Title Sheet.dwg



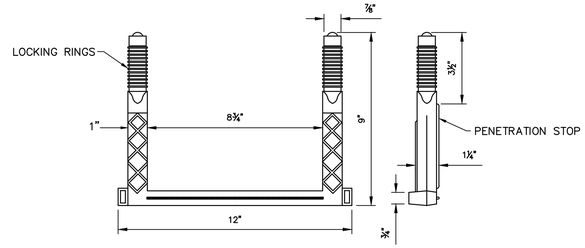
MANHOLE FRAME:
SELF SEALING GASKETED LIDS FOR SANITARY WITH SANITARY SEWER STAMPED ON THE LID. EAST JORDAN 1022Z1, NEENAH R-1772, OR APPROVED EQUAL.

IF CASTING IS LESS THAN 18" ABOVE THE 100-YEAR FLOOD ELEVATION OF ALL WATERWAYS, BOLT DOWN CASTING REQUIRED

SELF SEALING LIDS SHOULD BE STAMPED "SANITARY SEWER"

SECTION "A-A"

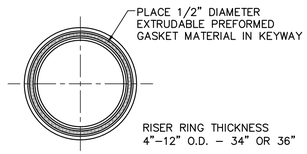
SANITARY SEWER MANHOLE FRAME AND COVER
NOT TO SCALE



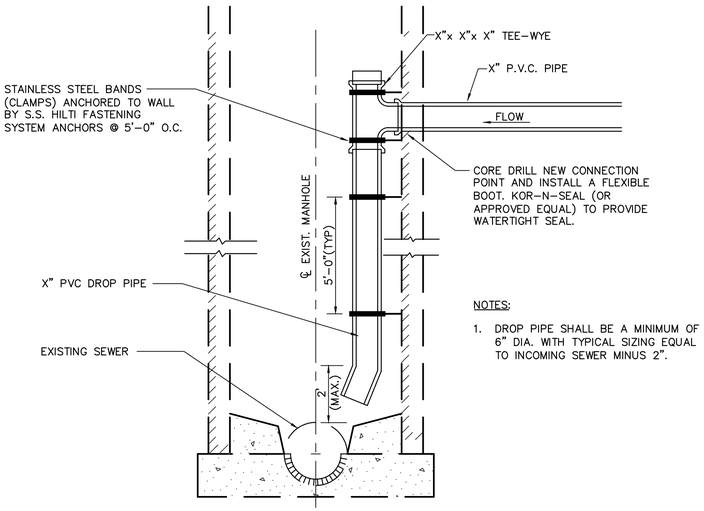
NOTES:

1. TO BE INSTALLED WITH NON-SHRINK MORTAR OR EPOXY GROUT.
2. STEPS SHALL NOT BE SITUATED DIRECTLY ABOVE INLET OR OUTLET PIPES.

FIBERGLASS REINFORCED POLYPROPYLENE MANHOLE STEPS
NOT TO SCALE



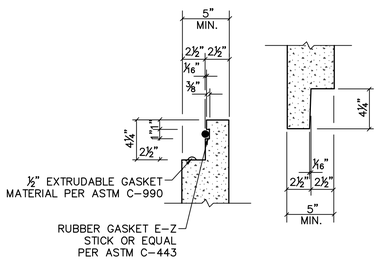
ADJUSTING RING
NOT TO SCALE



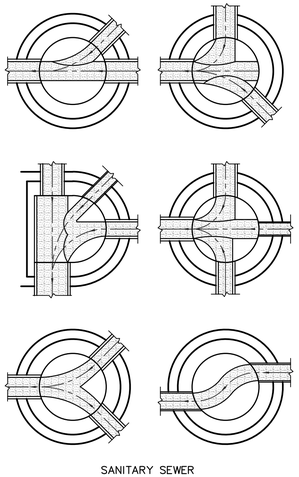
NOTES:

1. DROP PIPE SHALL BE A MINIMUM OF 6" DIA. WITH TYPICAL SIZING EQUAL TO INCOMING SEWER MINUS 2".

INTERIOR DROP CONNECTION AT EXISTING MANHOLE
NOT TO SCALE

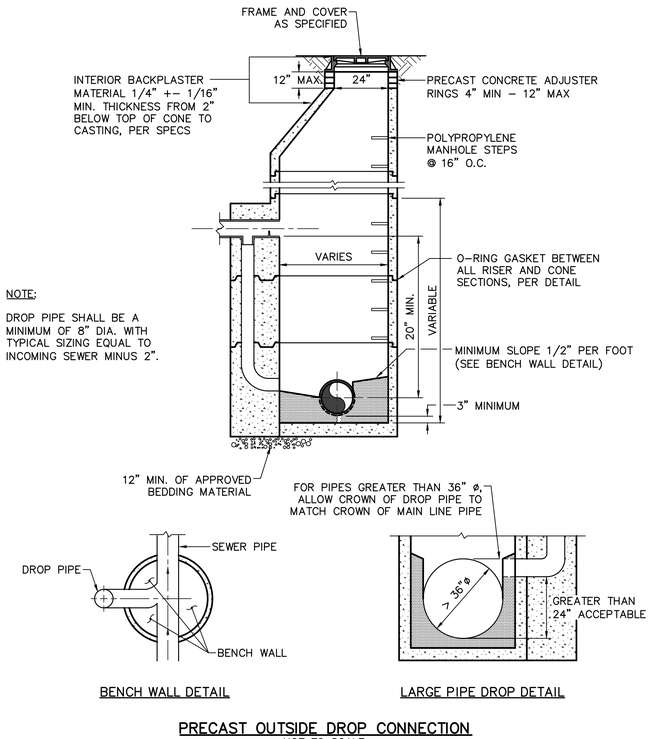


O-RING JOINT
NOT TO SCALE



SANITARY SEWER
BENCH SLOPE = 1/2" PER FOOT
TROUGH WIDTH = PIPE DIAMETER x 1.3

STANDARD MANHOLE BENCHES
NOT TO SCALE



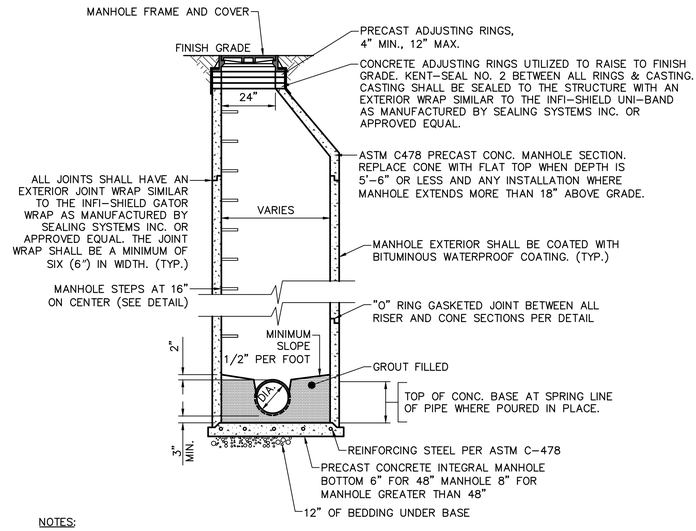
NOTE:

DROP PIPE SHALL BE A MINIMUM OF 8" DIA. WITH TYPICAL SIZING EQUAL TO INCOMING SEWER MINUS 2".

BENCH WALL DETAIL

LARGE PIPE DROP DETAIL

PRECAST OUTSIDE DROP CONNECTION
NOT TO SCALE



NOTES:

1. MANHOLE SHALL CONFORM TO ASTM C-478.
2. JOINTS SHALL CONFORM TO ASTM C-433.
3. PIPE CONNECTIONS TO MANHOLES SHALL BE MADE WITH WATERTIGHT FLEXIBLE RUBBER BOOTS WITH STAINLESS STEEL BANDS OR FLEXIBLE WATERTIGHT GASKETS. ACCEPTABLE PRODUCTS ARE: KOR-N-SEAL AS MANUFACTURED BY CORE AND SEAL COMPANY, DURA-SEAL III AS MANUFACTURED BY DURA TECH, INC., PSX AS MANUFACTURED BY THE PRESS SEAL GASKET CORPORATION, OR APPROVED EQUAL. PIPE SEAL SHALL MEET ASTM C-443.
4. PIPE OPENINGS IN BASE AND RISER SECTIONS SHALL BE FORMED OR CORE-DRILLED.

STANDARD PRECAST CONCRETE MANHOLE
(FOR PIPE SIZES 8" TO 24")
NOT TO SCALE

HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

STANDARD DETAILS

KAREN C. SANCHEZ
REGISTERED
No. PE11500679
STATE OF INDIANA
PROFESSIONAL ENGINEER

CERTIFIED BY

ISSUANCE INDEX
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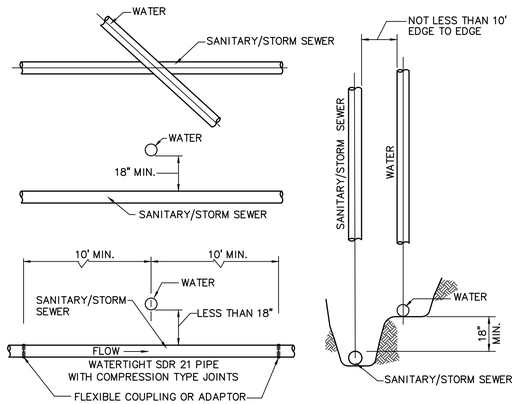
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4	ASTM REFERENCE	08/05/2019

Project Number 2000.00103

SANITARY SEWER STANDARD DETAILS

01

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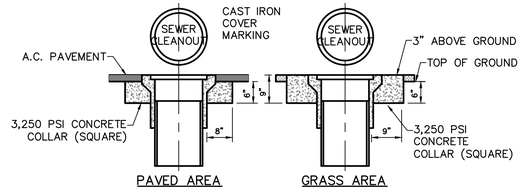


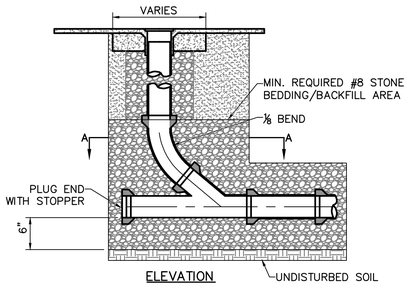
NOTES:

1. WHEN LATERAL SEPARATION IS 10' OR GREATER NO VERTICAL CLEARANCE IS NEEDED
2. ALL CROSSINGS AND SEPARATIONS TO BE 327 IAC, ARTICLES 3 & 8
3. WHEN HORIZONTAL SEPARATION IS LESS THAN 10' OR VERTICAL SEPARATION IS LESS THAN 18", SANITARY PIPE MUST BE WATERTIGHT SDR 21 WITH COMPRESSION TYPE JOINTS.
4. CONTRACTOR SHALL VERIFY THAT MORE STRINGENT SEPARATION REQUIREMENTS DO NOT EXIST WITH THE JURISDICTIONAL WATER UTILITY. IF THEY DO EXIST, CONTRACTOR SHALL FOLLOW THE MORE STRINGENT REQUIREMENTS.

MIN. CROSSOVER & SEPARATION REQUIREMENTS FOR WATER & SANITARY/STORM SEWERS

NOT TO SCALE



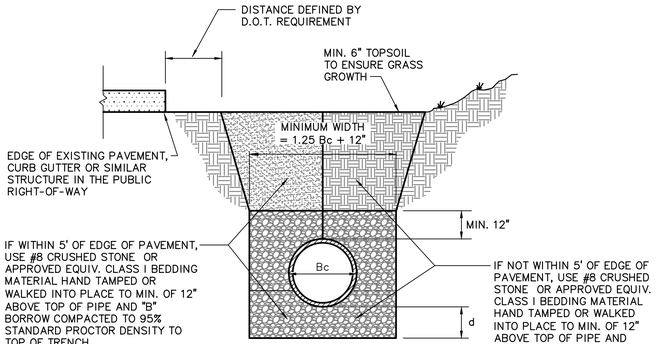


NOTES:

1. CLEANOUT PIPE TO BE SAME SIZE AND KIND OF MATERIAL AS MAIN
2. INSTALL SEWUR VALVE BY KODIAK CONTROLS, INC., OR APPROVED EQUAL

SEWER CLEANOUT

NOT TO SCALE



LEGEND

Bc= OUTSIDE DIAMETER
D= INSIDE DIAMETER
d= DEPTH OF BEDDING MATERIAL BELOW PIPE

NOTE:

ALL INITIAL BACKFILL SHALL BE INSTALLED IN 6" TO 12" BALANCED LIFTS.

A MINIMUM 9" OF CLEARANCE SHALL BE PROVIDED ON EACH SIDE OF THE INSTALLED PIPE.

DEPTH OF BEDDING MATERIAL BELOW PIPE

D	d (MIN)
27" & SMALLER	4
30" TO 60"	4
66" & LARGER	4

PLASTIC PIPE (PVC & HDPE) BEDDING DETAIL

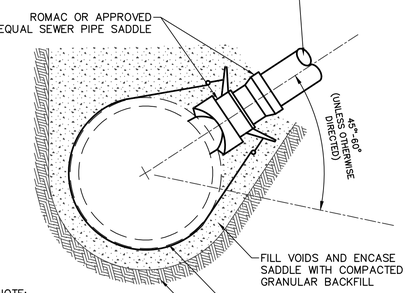
NOT TO SCALE

HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

STANDARD DETAILS

6" (SDR 26 PVC) RUBBER GASKET JOINTED 6"X4" REDUCER FITTING ALLOWED UPSTREAM OF TRANSITION POINT, WHICH FOR MAINLINE SEWER PROJECTS IS 15 FEET BEYOND RIGHT-OF-WAY AND FOR LATERAL REPLACEMENT PROJECTS IS THE RIGHT-OF-WAY LINE. RUBBER GASKET JOINTS FROM MAINLINE SEWER TO TRANSITION POINT. FERNCO COUPLINGS SHALL NOT BE USED EXCEPT TO CHANGE FROM ORIGINAL MATERIAL TO PVC AT BUILDING.

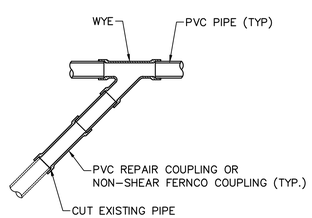


NOTE:

1. SEWER PIPE SADDLE SHOULD BE ROMAC INDUSTRIES, INC. STYLE "CB" SEWER SADDLE OR APPROVED EQUAL.

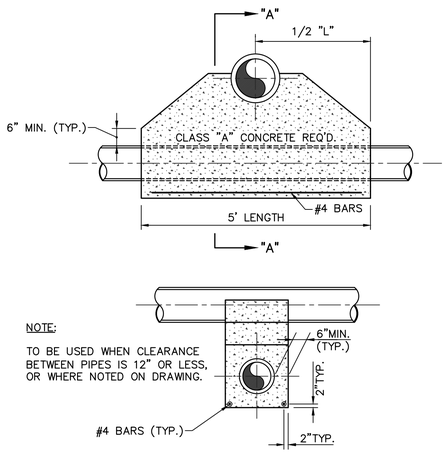
LATERAL CONNECTION TO EXISTING SEWER

NOT TO SCALE



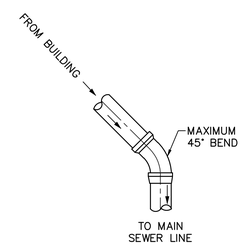
EXISTING LATERAL RECONNECTION DETAIL

NOT TO SCALE



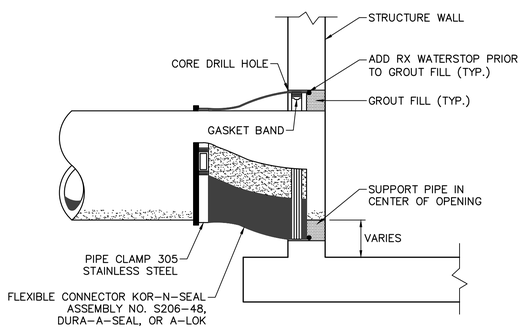
CONCRETE SADDLE DETAIL

NOT TO SCALE



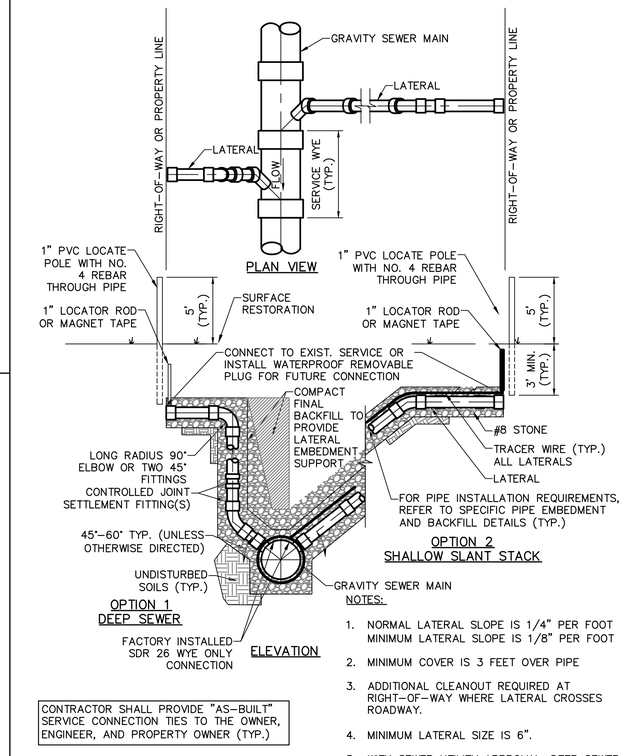
TYPICAL HORIZONTAL BEND IN LATERAL DETAIL

NOT TO SCALE



NEW CONNECTION TO EXISTING MANHOLE

NOT TO SCALE



CONTRACTOR SHALL PROVIDE "AS-BUILT" SERVICE CONNECTION TIES TO THE OWNER, ENGINEER, AND PROPERTY OWNER (TYP.)

NOTES:

1. NORMAL LATERAL SLOPE IS 1/4" PER FOOT MINIMUM LATERAL SLOPE IS 1/8" PER FOOT
2. MINIMUM COVER IS 3 FEET OVER PIPE
3. ADDITIONAL CLEANOUT REQUIRED AT RIGHT-OF-WAY WHERE LATERAL CROSSES ROADWAY.
4. MINIMUM LATERAL SIZE IS 6".
5. WITH SEWER UTILITY APPROVAL, DEEP SEWER SLANT STACK MAY BE INSTALLED.
6. LATERALS SHALL BE PVC SDR 26.

TYPICAL SERVICE CONNECTION

NOT TO SCALE

KAREN C. SAAVEDRA
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No.
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STATE OF
INDIANA
PROFESSIONAL ENGINEER

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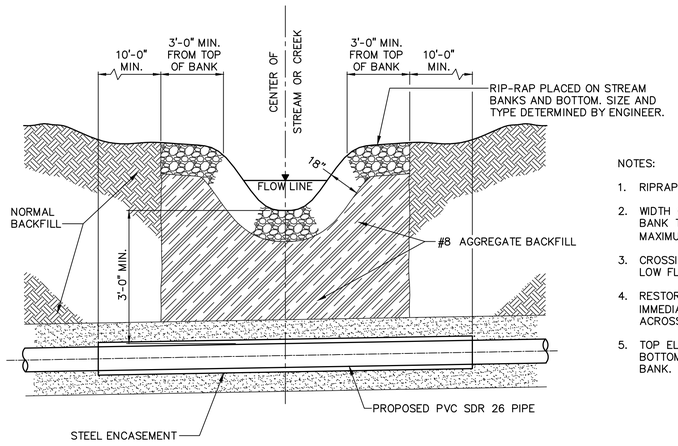
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Project Number 2000.00103

SANITARY SEWER STANDARD DETAILS

02

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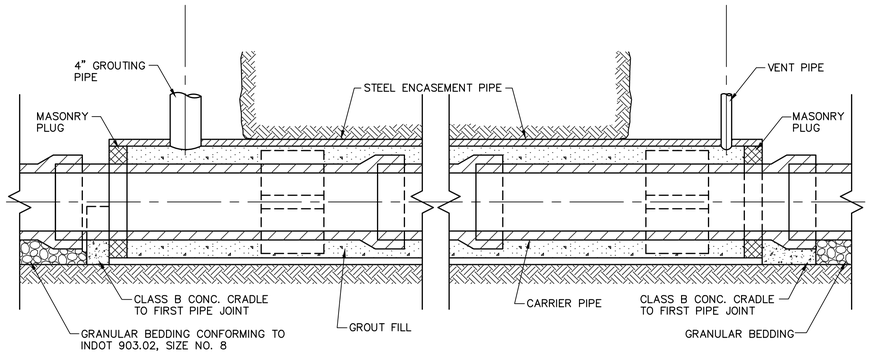


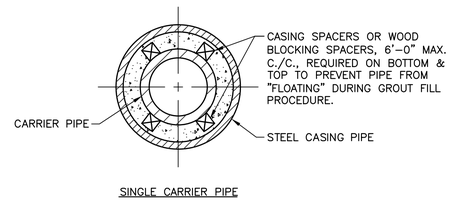
NOTES:

1. RIPRAP SHALL EXTEND FROM TOP OF BANK TO TOE OF SLOPE.
2. WIDTH OF RIPRAP SHALL EXTEND TO THOSE AREA ALONG THE BANK THAT HAVE BEEN DISTURBED DURING TRENCHING A MAXIMUM OF 10" WIDE.
3. CROSSING OF STREAMS SHALL BE DONE DURING PERIODS OF LOW FLOW.
4. RESTORATION OF STREAM BEDS AND BANKS SHALL IMMEDIATELY FOLLOW TRENCHING ACTIVITIES/PIPE INSTALLATION ACROSS THE STREAM BED.
5. TOP ELEVATION OF RIPRAP SHALL BE FLUSH WITH THE EXISTING BOTTOM ELEVATION OF THE CHANNEL AND SURROUNDING STREAM BANK.

TYPICAL STREAM CROSSING RESTORATION FOR OPEN CUT PIPE INSTALLATION

SCALE: NONE





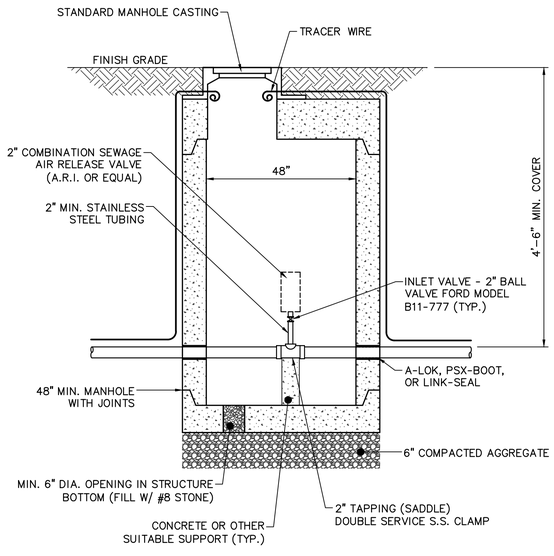
SINGLE CARRIER PIPE

NOTES:
1. WELD ALL ENCASEMENT PIPE JOINTS.
2. CASING PIPE DIAMETER EQUALS CARRIER PIPE'S LARGEST O.D. + 4" MIN.
3. ANNULAR SPACE BETWEEN CASING PIPE & CARRIER PIPE SHALL BE GROUT FILLED.

24" STEEL CASING SHALL HAVE 0.250" MIN. WALL THICKNESS
30" STEEL CASING SHALL HAVE 0.375" MIN. WALL THICKNESS
36" STEEL CASING SHALL HAVE 0.375" MIN. WALL THICKNESS
42" STEEL CASING SHALL HAVE 0.375" MIN. WALL THICKNESS

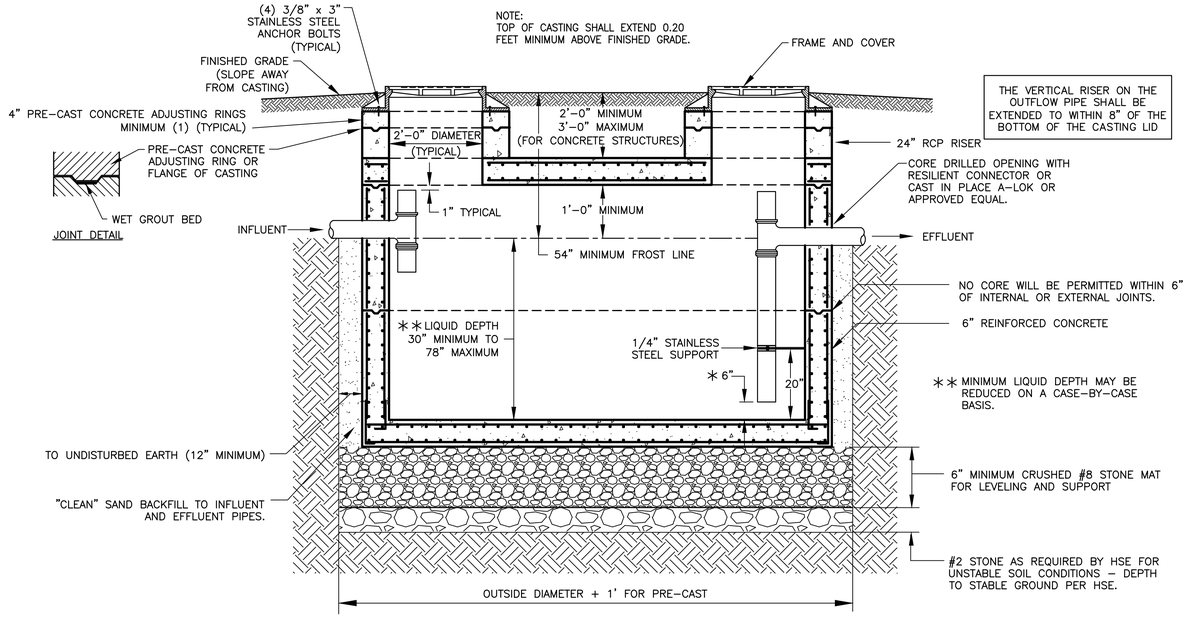
HORIZONTAL BORING DETAIL

NOT TO SCALE



COMBINATION AIR RELEASE VALVE

NOT TO SCALE



NOTE:

1. GREASE TRAPS MUST BE A MINIMUM OF 1000 GALLONS AND SIZED ACCORDING TO 410 IAC 6-10.1-66.
2. GREASE TRAP SHALL CONFORM TO ASTM C 478 UTILIZING 4,000 PSI CONCRETE. CONTRACTOR MAY SUPPLY GREASE TRAP AS MANUFACTURED BY ZURN SERIES Z-1170 OR JAY R. SMITH MANUFACTURING COMPANY SERIES 8000 OR EQUAL.
3. EXTERIOR INSTALLATION MUST BE CONCRETE OR CAST IRON.

EXTERIOR GREASE TRAP DETAIL

NOT TO SCALE

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

STANDARD DETAILS

KAREN C. SAAVEDRA REGISTERED No. PE11500679 STATE OF INDIANA PROFESSIONAL ENGINEER

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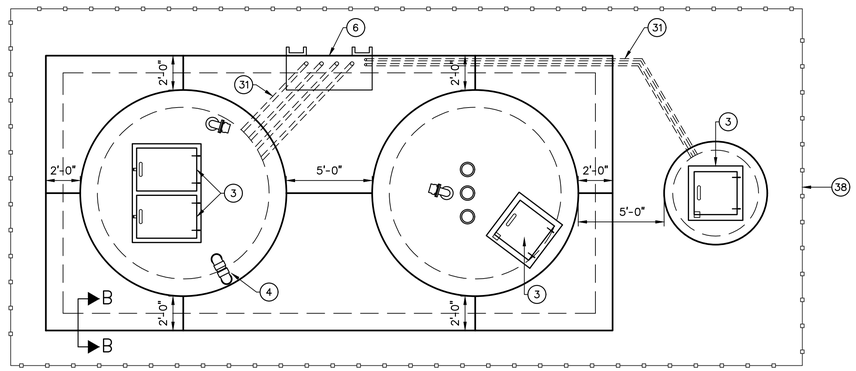
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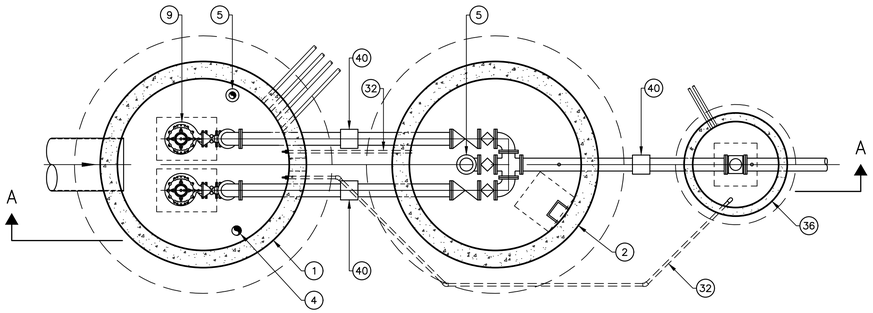
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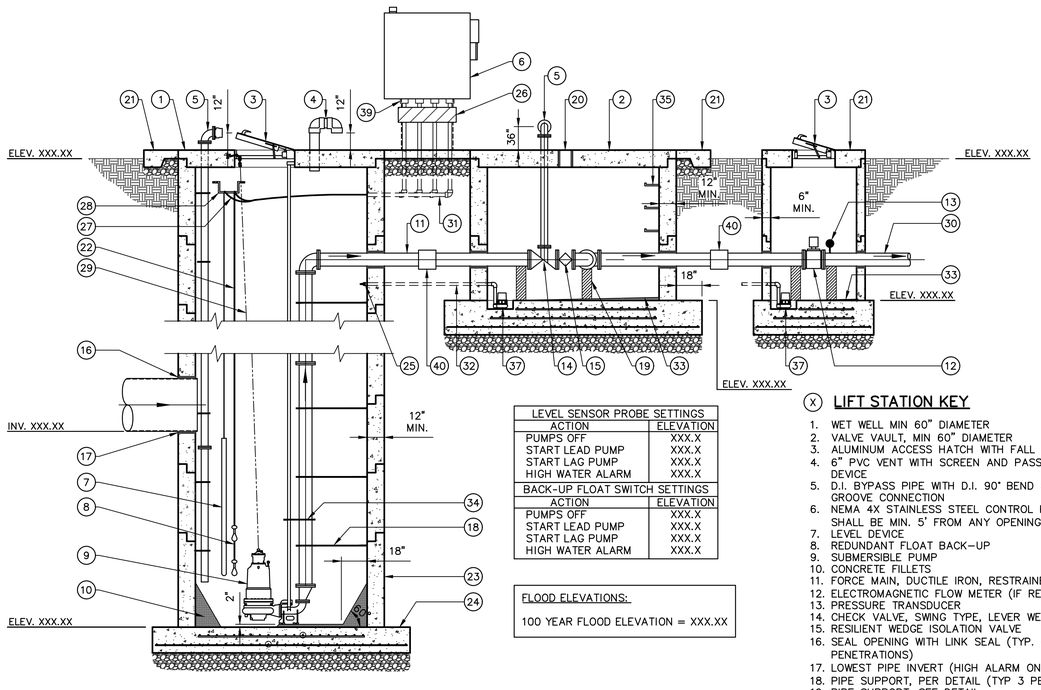


PLAN VIEW AT GRADE
NOT TO SCALE

NOTE:
APPLY PREFORMED JOINT MATERIAL BETWEEN ALL PRECAST STRUCTURES AND CAST IN PLACE CONCRETE. SEAL EXPANSION JOINTS WITH TREMFLEX SL JOINT SEALANT OR APPROVED EQUIVALENT CONFORMING TO ASTM C-920 (TYP.)



LIFT STATION PLAN VIEW BELOW TOP SLAB
NOT TO SCALE



LIFT STATION SECTION A-A
NOT TO SCALE

LEVEL SENSOR PROBE SETTINGS	
ACTION	ELEVATION
PUMPS OFF	XXX.X
START LEAD PUMP	XXX.X
START LAG PUMP	XXX.X
HIGH WATER ALARM	XXX.X
BACK-UP FLOAT SWITCH SETTINGS	
ACTION	ELEVATION
PUMPS OFF	XXX.X
START LEAD PUMP	XXX.X
START LAG PUMP	XXX.X
HIGH WATER ALARM	XXX.X

FLOOD ELEVATIONS:

100 YEAR FLOOD ELEVATION = XXX.XX

(X) LIFT STATION KEY

1. WET WELL MIN 60" DIAMETER
2. VALVE VAULT, MIN 60" DIAMETER
3. ALUMINUM ACCESS HATCH WITH FALL PROTECTION
4. 6" PVC VENT WITH SCREEN AND PASSIVE ODOR CONTROL DEVICE
5. D.I. BYPASS PIPE WITH D.I. 90° BEND & CAM AND GROOVE CONNECTION
6. NEMA 4X STAINLESS STEEL CONTROL PANEL. PANEL SHALL BE MIN. 5' FROM ANY OPENING OR OBSTRUCTION
7. LEVEL DEVICE
8. REDUNDANT FLOAT BACK-UP
9. SUBMERSIBLE PUMP
10. CONCRETE FILLETS
11. FORCE MAIN, DUCTILE IRON, RESTRAINED JOINTS
12. ELECTROMAGNETIC FLOW METER (IF REQUESTED)
13. PRESSURE TRANSDUCER
14. CHECK VALVE, SWING TYPE, LEVER WEIGHT OPERATED
15. RESILIENT WEDGE ISOLATION VALVE
16. SEAL OPENING WITH LINK SEAL (TYP. ALL PIPE PENETRATIONS)
17. LOWEST PIPE INVERT (HIGH ALARM ON)
18. PIPE SUPPORT, PER DETAIL (TYP 3 PER PIPE SECTION)
19. PIPE SUPPORT, SEE DETAIL
20. STAINLESS STEEL STEM WITH OPERATOR NUT 1/2" BELOW CONCRETE SLAB AND STAINLESS STEEL COVERS AND FASTENERS.
21. TOP OF STRUCTURE, MIN. 6", MAX. 12" ABOVE FINISH GRADE
22. STAINLESS STEEL GUIDE RAIL
23. MONOLITHIC BASE
24. ANTI-FLOTATION EXTENSIONS (AS REQUIRED)
25. BACKFLOW PREVENTER/ DUCKBILL
26. VENTED JUNCTION BOX
27. SEPARATE CONDUITS FOR EACH PUMP
28. CABLE HANGER
29. STAINLESS STEEL LIFTING CABLE SIZED TO THE WEIGHT OF THE PUMP
30. FORCE MAIN TRANSITION FITTING FROM DUCTILE IRON TO ALTERNATE MATERIAL
31. CONDUIT PUMP TO JUNCTION BOX – PVC COATED RGS
32. PVC DRAIN PIPE, MAINTAIN 1/4" PER FOOT INTO WET WELL
33. SLOPE FLOOR TO DRAIN 1/4" PER FOOT
34. INTERMEDIATE GUIDE RAIL SUPPORT
35. FIBERGLASS REINFORCED POLYPROPYLENE MANHOLE STEPS AT 16" ON CENTER
36. METER VAULT, MIN. 60" DIAMETER
37. SUMP PUMP
38. 6' HIGH CHAIN LINK FENCE WITH BARBED WIRE
39. EPOXY CONDUIT SEALS
40. FLEXIBLE COUPLING (TYP.)

INFORMATION

COUNTY: _____ TOWNSHIP: _____

SECTION: _____ TWP: _____ RANGE: _____

PROJECT: _____

LOCATION: _____

_____

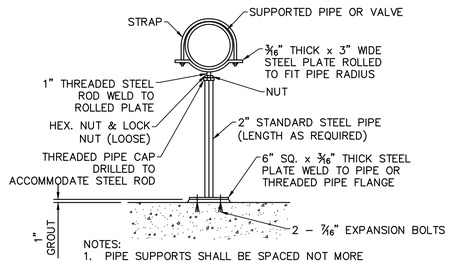
STATION PIPE SIZE, INCHES: _____ FORCE MAIN TYPE: _____

FORCE MAIN SIZE, INCHES: _____ LIFT STATION I.D.: _____

FORCE MAIN LENGTH, FEET: _____

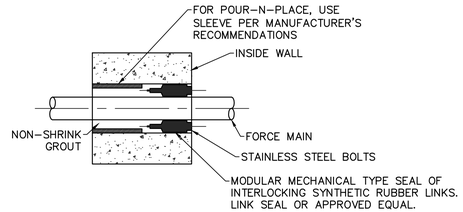
PUMP DATA

	KSB	MYERS
DISCHARGE SIZE:		
GPM:		
TDH:		
HP:		
RPM:		
VOLTAGE:		
PHASE:		
MODEL:		
IMPELLER SIZE:		



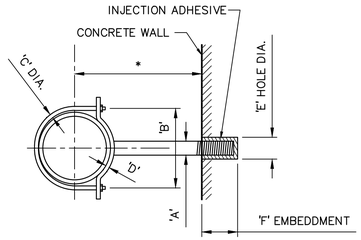
NOTES:
1. PIPE SUPPORTS SHALL BE SPACED NOT MORE THAN 12'-0" ON CENTER.
2. PIPE TO BE SUPPORTED EACH SIDE OF VALVES, FLOW METERS, AND COUPLINGS.

ADJUSTABLE PIPE SUPPORT DETAIL
NOT TO SCALE



NOTE:
WALLS SHALL BE CORE DRILLED

PIPE SLEEVE DETAIL FOR ALL WALL PENETRATIONS
NOT TO SCALE

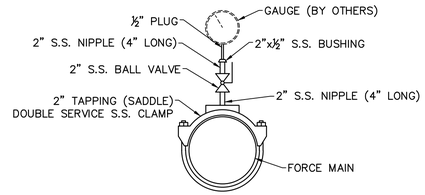


PIPE SUPPORT DIMENSIONS						
PIPE SIZE	A	B	C	D	E	F
4"	7/8"	5 1/4"	5/8"	1/4" X 1 1/4"	1 1/16"	6"
8"	1"	9 3/8"	5/8"	3/8" x 1 1/2"	1 1/16"	6"
12"	1 1/4"	13 1/2"	5/8"	5/8" x 2"	1 1/16"	6"

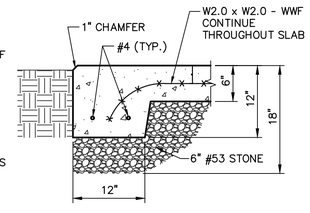
PIPE SUPPORT NOTES:

1. CONTRACTOR SHALL DETERMINE DIMENSION * PER PUMP MANUFACTURER'S INSTALLATION INSTRUCTIONS.
2. PIPE SUPPORTS SHALL BE CARBON STEEL, COATED WITH 14 MIL COAL TAR EPOXY.
3. INJECTION ADHESIVE SHALL BE HIT HY 150 BY HILTI OR APPROVED EQUAL. INSTALL PER HILTI INSTALLATION INSTRUCTIONS FOR ROD INSTALLATION.
4. PIPE SUPPORT SHALL BE GRINNEL FIGURE 191 OR APPROVED EQUAL.

PIPE SUPPORT
NOT TO SCALE



PRESSURE GAUGE TAP DETAIL (TYP.)
NOT TO SCALE



SECTION B-B
NOT TO SCALE
(TYP. FOR ALL WET WELL SLABS)

GENERAL NOTES:

1. PUMP CONTROL PANEL SHALL BE PROVIDED BY PUMP SUPPLIER AND SHALL BE COMPATIBLE WITH PUMP SYSTEM. THE PANEL SHALL CONTROL A DUPLEX SYSTEM.
2. ALL PIPING IN AND BETWEEN WET WELL, VALVE VAULT, AND METER VAULT, SHALL BE DUCTILE IRON.
3. DUCTILE IRON PIPE: A. SHALL CONFORM TO ANSI SPEC. A-21.51 B. SHALL CONFORM TO AWWA C-151, CURRENT REV. C. DUCTILE IRON PIPE SHALL BE PRESSURE CLASS 350 (MIN.)
4. WET WELL HATCH SHALL BE COMPATIBLE WITH THE GUIDE RAIL SYSTEM AND SHALL BE LOCATED AS SHOWN SUCH THAT PUMPS CAN BE EASILY REMOVED FROM THE WET WELL. SAFETY GRATE SHALL ALLOW OBSERVATION OF WET WELL WHILE PREVENTING FALLS INTO WET WELL.
5. MAINTAIN 24 INCHES BETWEEN ALL STRUCTURES, SLAB, AND FENCING.
6. 8" RESILIENT WEDGE VALVES SHALL BE OPERABLE FROM THE TOP SLAB. CONTRACTOR SHALL PROVIDE ONE (1) 'TEE' HANDLED VALVE KEY TO MATCH RESILIENT WEDGE VALVE OPERATING NUTS.
7. ALL PIPING, STRUCTURE EXCAVATION AND TRENCHES SHALL BE BACKFILLED WITH AN APPROVED STRUCTURAL BACKFILL.

HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

STANDARD DETAILS

KAREN C. SAAVEDRA
REGISTERED
No. PE11500679
STATE OF INDIANA
PROFESSIONAL ENGINEER

CERTIFIED BY

ISSUANCE INDEX
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04/30/2021

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3	GENERAL REVISIONS	01/03/2019
4	ASTM REFERENCE	08/05/2019

Project Number 2000.00103

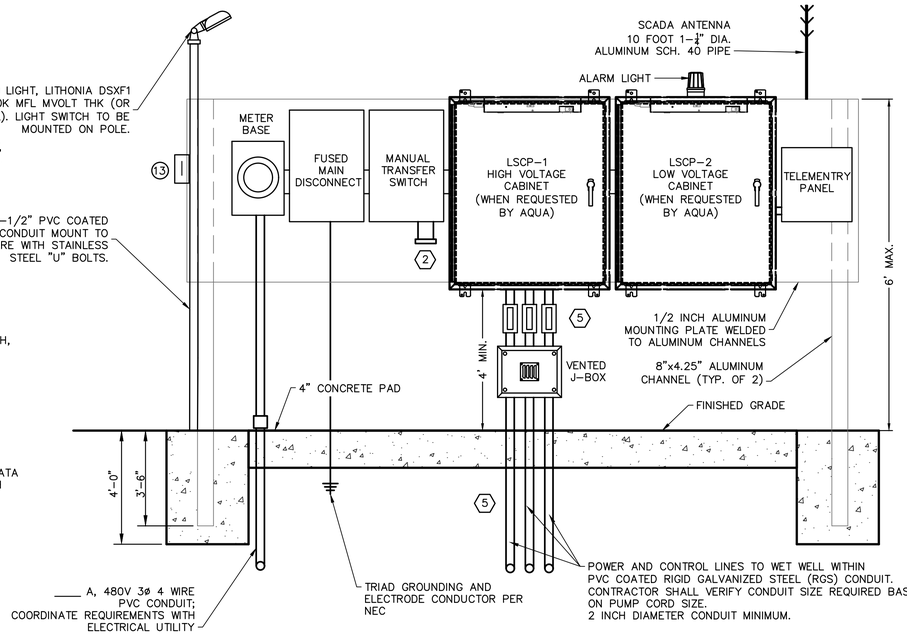
SANITARY SEWER STANDARD DETAILS

04

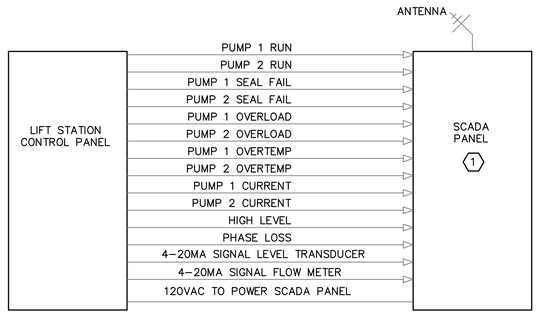
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NEMA 4X CONTROL PANEL DEVICE LEGEND

ITEM#	DESCRIPTION
1	ILSCO (OR EQUAL) POWER DISTRIBUTION BLOCK.
2	PILOT DEVICES (TYPICAL FOR EACH PUMP): RUNNING LIGHT, FAIL LIGHT, SEAL FAIL LIGHT, HIGH MOTOR TEMP LIGHT, HOA SWITCH, AND ELAPSED TIME METER. PILOT DEVICES TO BE MOUNTED ON PANEL DEAD FRONT.
3	ALARM ACKNOWLEDGE PUSHBUTTON LOCATED ON SIDE OF PANEL.
4	NEMA 4 ALARM LIGHT.
5	ALTERNATING RELAYS AND CONTROL RELAYS AS REQUIRED.
6	SQUARE D (OR EQUAL) IEC STARTER SIZED PER PUMP FLA.
7	ISOLATION CIRCUIT BREAKERS WITH LOCKOUT/TAGOUT CAPABILITY. BREAKER ACCESSIBLE THROUGH DEAD FRONT.
8	MISCELLANEOUS COMPONENTS INCLUDING BUT NOT LIMITED TO PILOT RELAYS, TERMINAL BLOCKS, CIRCUIT BREAKERS, CONTROL TRANSFORMER, POWER SUPPLIES, ETHERNET SWITCH, PHASE LOSS RELAYS, ETC. TO PROVIDE FOR A COMPLETE AND FUNCTIONING CONTROL PANEL.
9	PROVIDE INTRINSICALLY SAFE BARRIERS FOR NEW FLOATS.
10	HEATER WITH INTEGRAL THERMOSTAT.
11	PUMP CONTROL MFR. TO COORDINATE WITH OWNER AND PROVIDE MONITORING POINTS AS REQUIRED FOR SCADATA.
12	PROVIDE CURRENT TRANSDUCER (CT) WIRE TO DEAD FRONT PANEL METER AND TO SCADATA SYSTEM. CURRENT DISPLAYS MOUNTED ON DEAD FRONT PANEL SHALL BE SCALABLE WITH INPUT SIGNAL TO MATCH CT. 4–20mA SIGNAL ONLY.
13	MOUNT LIGHT SWITCH FOR FLOOD LIGHT TO LIGHT POST.
14	PROVIDE AND MOUNT TO PANEL DEAD FRONT A 20A RATED CONVENIENCE OUTLET.



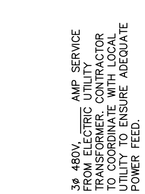
ELECTRICAL AND PUMP CONTROL MOUNTING DETAIL
NOT TO SCALE



SCADA DETAIL
NOT TO SCALE

NOTES:

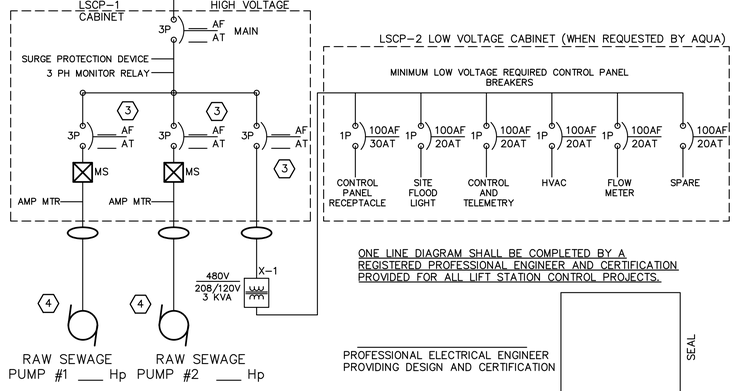
1. SIZE NEMA 4X CONTROL PANEL AS REQUIRED.
2. CONTROL PANEL SHALL BE CONSTRUCTED TO UL STANDARDS IN A UL PANEL SHOP. CONTROL PANEL SHALL BE UL LISTED.
3. CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH THE ELECTRIC UTILITY TO PROVIDE POWER SERVICE TO THE NEW LIFT STATION. PROVIDE CONDUIT, WIRE, METER BASE, ETC. TO PROVIDE POWER COMPLETE TO THE LIFT STATION.
4. CONTRACTOR TO PROVIDE METER BASE PER ELECTRIC UTILITY METER BASE REQUIREMENTS.
5. ALL COSTS ASSOCIATED WITH PROVIDING POWER TO THE LIFT STATION SHALL BE INCLUDED IN THE CONTRACTOR'S BID PRICE; EXCEPT ANY CHARGES BY THE UTILITY COMPANY FOR THEIR WORK.
6. PROVIDE FLOAT CONTROL (4 FLOATS).
7. CONTROL PANEL SHALL BE CONSTRUCTED AND PROGRAMMED TO PROVIDE AUTOMATIC LEVEL CONTROL. PUMP SHALL CYCLE TO MAINTAIN LEVEL SETPOINT. PROVIDE AUTOMATIC ALTERNATION BETWEEN PRIMARY AND BACKUP TO ALTERNATE EACH TIME THEY RUN. HIGH LEVEL FLOAT SHALL BE HARDWIRED TO START BOTH PUMPS. LOW LEVEL CUTOUT FLOAT SHALL STOP BOTH PUMPS AFTER A HIGH LEVEL FLOAT HARDWIRED START VIA A LATCHING RELAY.
8. AN ARC FLASH STUDY SHALL BE COMPLETED AS PART OF THIS PROJECT AND ARC FLASH DECALS SHALL BE PLACED ON ALL ELECTRICAL CABINETS AS REQUIRED BY STUDY.



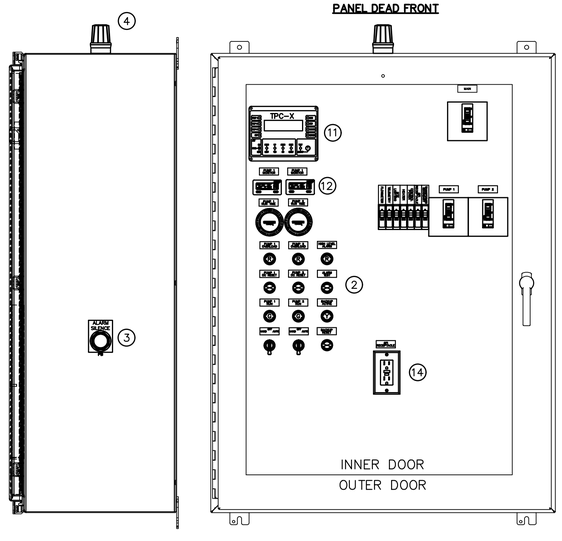
Load Wiring Schedule		
	Copper Wire	
Type #:	Quantity and Wire Size	Conduit
20	3 #12's & #12 Ground	3/4"
30	3 #10's & #10 Ground	3/4"
50	3 #8's & #10 Ground	3/4"
60	3 #6's & #8 Ground	3/4"
80	3 #4's & #8 Ground	1"
100	3 #2's & #6 Ground	1.5"
125	3#1's & #6 Ground	1.5"
150	3 - 2/0 & #6 Ground	2"
200	3 - 4/0 & #4 Ground	2.5"
250	3 - 300's & #4 Ground	3"

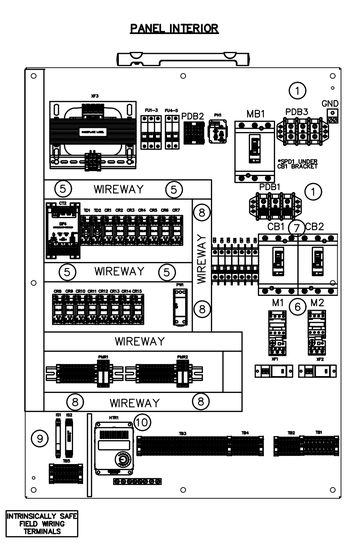
NOTES:

1. COORDINATE WITH OWNER REGARDING THE WIRING REQUIREMENTS FOR THE SCADA SYSTEM.
2. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH THE OWNER REGARDING THE CORRECT PART NUMBERS TO PROVIDE THE OWNERS STANDARD FOR THE GENERATOR PLUG.
3. COORDINATE WITH THE CONTRACTOR AND EQUIPMENT SUPPLIERS WHEN SELECTING THE CIRCUIT BREAKER SIZES TO ENSURE NEW CIRCUIT BREAKERS ARE PROPERLY SIZED.
4. WIRE PUMP SAFETIES AND LEVEL CONTROLS AS REQUIRED. REFERENCE DS SPECIFICATIONS AND COORDINATE WITH CONTRACTOR DURING BIDDING AND CONSTRUCTION. INTEGRATE PUMP SAFETY RELAYS INTO CONTROL PANEL AS REQUIRED BY PUMP MANUFACTURER.
5. ALL CONDUIT CONNECTED TO WET WELL SHALL BE PVC COATED RIGID GALVANIZED STEEL. ALL OTHER CONDUIT SHALL BE ALUMINUM OR OWNER APPROVED MATERIAL.

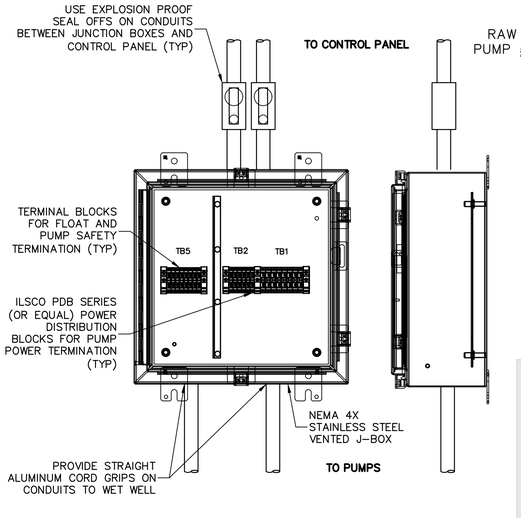


ONE LINE REFERENCE DIAGRAM
NOT TO SCALE

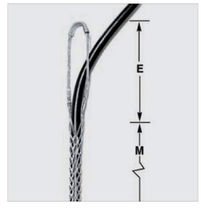




LIFT STATION CONTROL PANEL DETAIL
NOT TO SCALE



J–BOX DETAIL
NOT TO SCALE



Single Eye, Split Mesh, Lace Closing

Single Eye, Split Mesh, Lace Closing*

For permanent support when cable end is not available to be installed through grip.

Cable Diameter Range Inches (cm)	Approx. Breaking Strength Lbs. (N)	E Inches (cm)	M Inches (cm)	Catalog Number
.75"-.99" (1.90-2.51)	2,820 (12,543)	10" (25.40)	25" (63.50)	**02207010**
1.00"-1.24" (2.54-3.15)	4,280 (19,037)	12" (30.48)	28" (71.12)	**02207011**
1.25"-1.49" (3.17-3.78)	4,280 (19,037)	12" (30.48)	30" (76.20)	**02207012**
1.50"-1.99" (3.81-5.05)	4,280 (19,037)	12" (30.48)	34" (86.36)	**02207013**

Note: E-Eye length.
M-Mesh length at nominal diameter.
** Change catalog number from 022 to 024 for stainless steel. Consult factory for availability.*

STAINLESS STEEL CABLE SUPPORT DETAIL
NOT TO SCALE

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

STANDARD DETAILS

KAREN C. SKAVENSKI — REGISTERED — No. PE11500679 — STATE OF INDIANA — PROFESSIONAL ENGINEER

CERTIFIED BY

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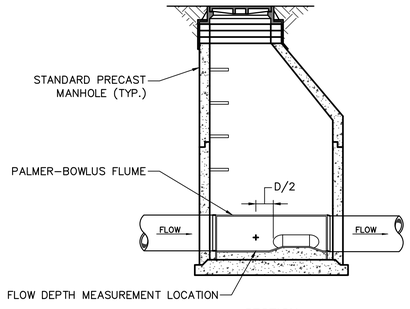
Project Number 2000.00103

SANITARY SEWER STANDARD DETAILS

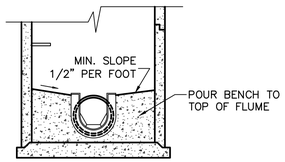
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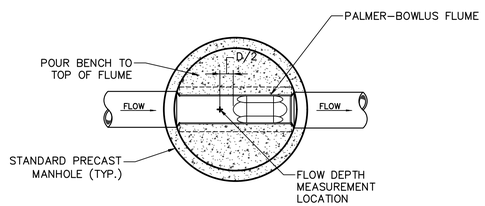
FLUME										MANHOLE SIZE	SLOPE UPSTREAM (%)
MAXIMUM DISCHARGE			HEAD	MODEL	DIMENSIONS (INCHES)						
GPM	MGD	CFS	INCHES		D	D/2	R	H	Z	MIN.	MAX.
165	0.238	0.388	4.70	PBF–6	6	2	1.00	8	25	6' DIA.	2.2
343	0.494	0.764	6.30	PBF–8	8	3	1.33	10	33	6' DIA.	2.0
603	0.868	1.344	7.90	PBF–10	10	4	1.67	12	41	6' DIA.	1.8



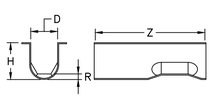
SECTION



SECTION



PLAN VIEW

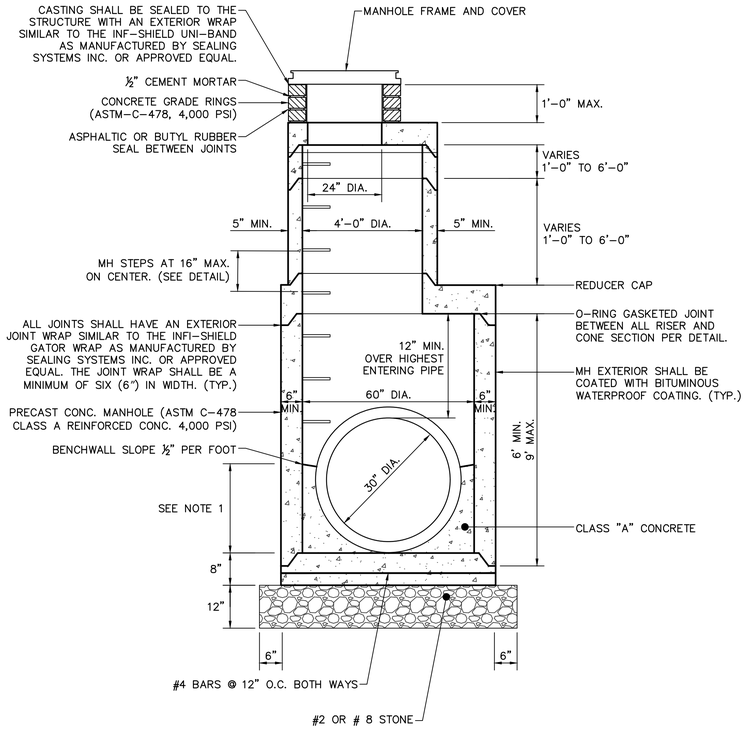


PALMER–BOWLUS FLUME

NOTES:

1. FLUME SHALL BE A PALMER–BOWLUS FLUME.
2. FIELD POUR CONCRETE BENCH WITH FLUME INSTALLED IN MANHOLE AT LINE SLOPE.
3. FLUME SELECTION SHALL BE BASED UPON THE FLOW TO BE MEASURED AND NOT UPON THE PIPE SIZE.

SAMPLING AND METERING CONTROL MANHOLE DETAIL
NOT TO SCALE



NOTES:

1. BENCH WALLS SHALL FORM A DEFINED CHANNEL TO A MINIMUM HEIGHT OF 80% OF THE INSIDE DIAMETER OF THE INLET AND OUTLET PIPES.
2. MANHOLE SHALL CONFORM TO ASTM C–478.
3. JOINTS SHALL CONFORM TO ASTM C–433.
4. PIPE CONNECTIONS TO MANHOLES SHALL BE MADE WITH WATERTIGHT FLEXIBLE RUBBER BOOTS WITH STAINLESS STEEL BANDS OR FLEXIBLE WATERTIGHT GASKETS. ACCEPTABLE PRODUCTS ARE: KOR–N–SEAL AS MANUFACTURED BY CORE AND SEAL COMPANY, DURA–SEAL III AS MANUFACTURED BY DURA TECH, INC., PSX AS MANUFACTURED BY THE PRESS SEAL GASKET CORPORATION, OR APPROVED EQUAL. PIPE SEAL SHALL MEET ASTM C–443.
5. PIPE OPENINGS IN BASE AND RISER SECTIONS SHALL BE FORMED OR CORE–DRILLED.

60" SANITARY MANHOLE DETAIL
NOT TO SCALE

HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

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KAREN C. SAAVEDRA
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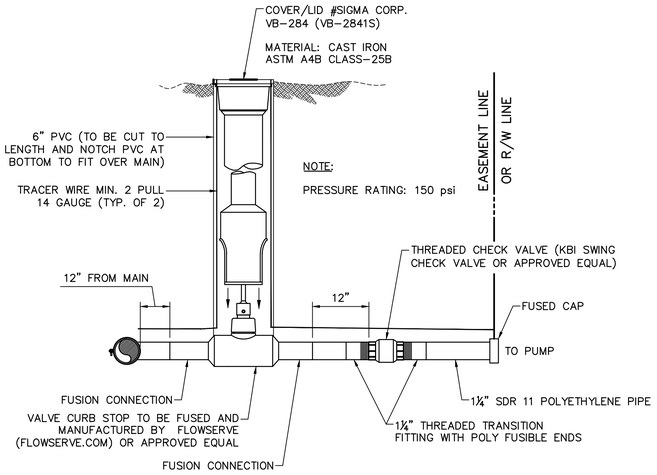
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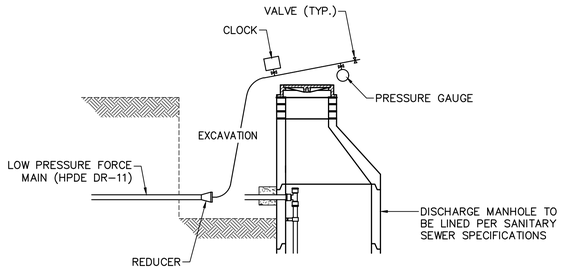
SANITARY SEWER STANDARD DETAILS

05

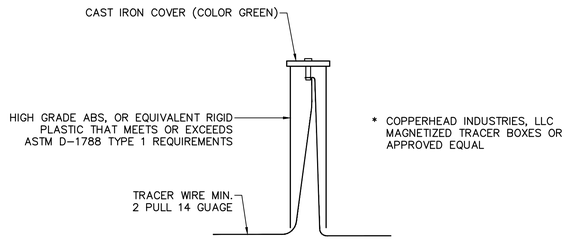
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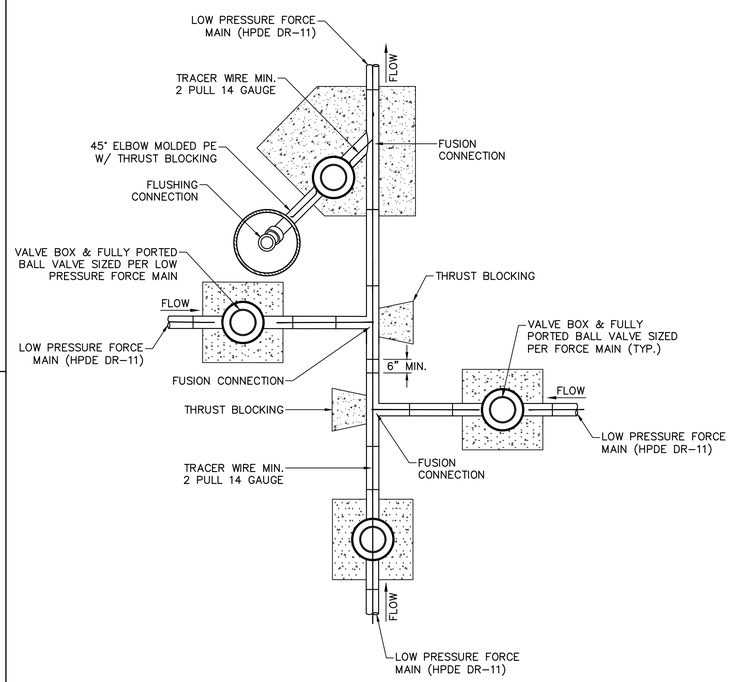
PLASTIC LATERAL ASSEMBLY
(1-1/4" SDR 11 HDPE PIPE ARCH PATTERN)
NOT TO SCALE



TYPICAL TESTING OF LOW PRESSURE FORCE MAIN
NOT TO SCALE



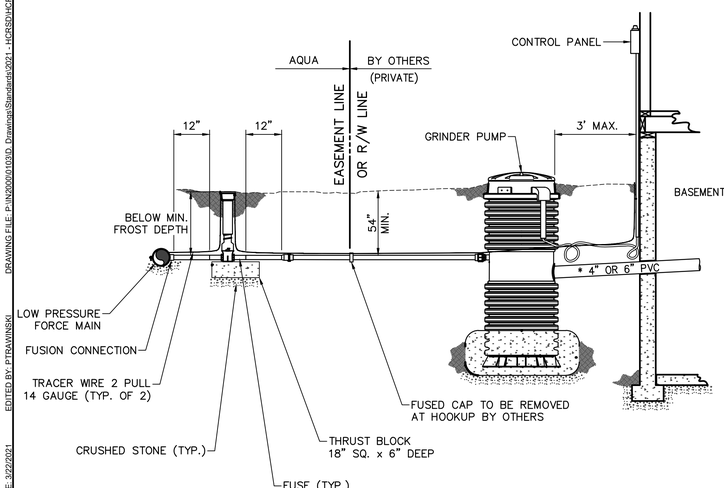
CATHODIC TEST STATION
(TRACER NODE)
NOT TO SCALE



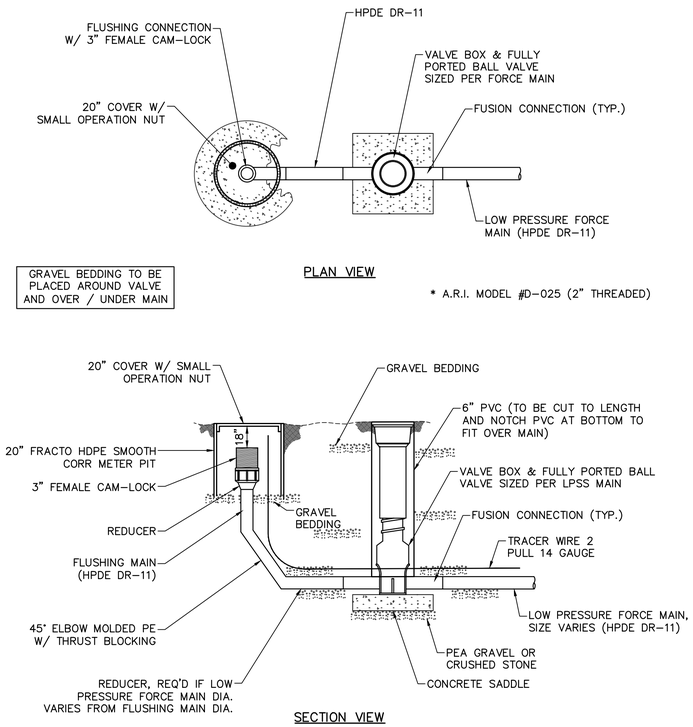
TYPICAL TYPE II INTERSECTION DETAIL
NOT TO SCALE

NOTES:

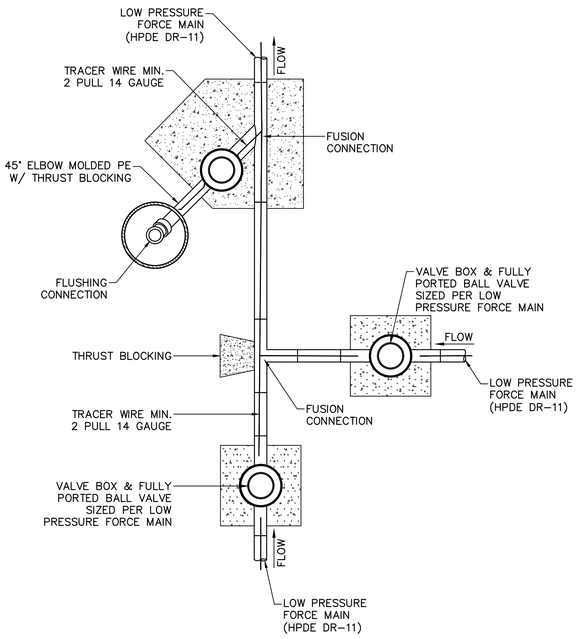
1. ALL LATERALS TO BE DIRECTIONAL DRILLED ACROSS STREET.
2. ALL CONNECTIONS SHALL BE ELECTRO-FUSION OR THREADED TRANSITION FITTING. COMPRESSION FITTINGS ARE NOT ACCEPTABLE.
* IF GREATER THAN 3', CLEANOUT MUST BE IMPLEMENTED AND 6" PIPE MUST BE USED.



TYPICAL LATERAL INSTALLATION
NOT TO SCALE



TYPICAL TERMINAL END WITH FLUSHING STATION DETAIL
NOT TO SCALE



TYPICAL INTERSECTION, TYPE I DETAIL
NOT TO SCALE

HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

STANDARD DETAILS

KAREN C. SAAVEDRA
REGISTERED
No. PE11500679
STATE OF INDIANA
PROFESSIONAL ENGINEER

CERTIFIED BY

ISSUANCE INDEX
DATE:
04/30/2021

REVISION SCHEDULE			
NO.	DESCRIPTION	DATE
1	SHEET ADDED	12/10/2018
3	REVISIONS TO AIR RELEASE VALVE LATERAL CONNECTION TO EXISTING SEWER	01/03/2019
4	DETAIL AND LIFT STATION SPECIFICATIONS UPDATES	01/21/2021
SPECIFICATIONS		
1	UPDATED TESTING REQ. PER IDEM COMMENTS	01/20/2017
2	UPDATED TESTING REQ. PER IDEM COMMENTS	12/10/2018
3	GENERAL REVISIONS	01/03/2019
4	ASTM REFERENCE	08/05/2019

Project Number 2000.00103

LOW PRESSURE SEWER
STANDARD DETAILS

06

PLOT DATE: 5/3/2021 12:32 PM
PLOT SCALE: 1:1
EDIT DATE: 3/22/2021
EDITED BY: PTRAWINSKI
DRAWING FILE: P:\IN2000\01010\D Drawings\Standards\2021 - HCRSD\HCRSD - Details - Low Pressure Sewer.dwg

FOREWORD

THE "STANDARD SANITARY SEWER SPECIFICATIONS" FOR HENDRICKS COUNTY REGIONAL SEWER DISTRICT (HCRSD) HAVE BEEN PREPARED TO SET FORTH THE DISTRICT'S MINIMUM CRITERIA FOR CONSTRUCTION WITHIN HCRSD'S LIMITS.

ALL CONSTRUCTION PROJECTS WHICH ARE CONNECTED TO THE HCRSD SYSTEM SHALL CONFORM TO THESE STANDARDS. CONSTRUCTION DRAWINGS AND SPECIFICATIONS MUST BE APPROVED BY THE HCRSD AND A WRITTEN PERMIT OBTAINED FOR SEWER EXTENSIONS IN ACCORDANCE WITH EXISTING ORDINANCES BEFORE CONSTRUCTION BEGINS. IN ADDITION, SANITARY SEWER PROJECTS MUST BE SUBMITTED TO THE INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (IDEM) FOR APPROVAL AND ISSUANCE OF A CONSTRUCTION PERMIT. DEVELOPERS MAY NOT SUBMIT PROJECTS TO IDEM UNTIL HCRSD ISSUES A WASTELOAD ALLOCATION AND APPROVAL OF PLANS.

CONSTRUCTION OBSERVATION WILL BE PERFORMED BY HCRSD. A MINIMUM OF 48 HOURS' NOTICE SHALL BE GIVEN PRIOR TO STARTING CONSTRUCTION.

THESE STANDARDS WERE PREPARED WITH THE INTENT OF OBTAINING THE HIGHEST QUALITY OF CONSTRUCTION POSSIBLE, CONSISTENT WITH ACCEPTED INDUSTRY PRACTICES AND SPECIFICATIONS. AS NEW MATERIALS BECOME AVAILABLE AND ACCEPTABLE, THE STANDARDS MAY BE REVISED AND UPDATED.

PART 1 – GENERAL

1.1 SCOPE OF WORK
THE WORK UNDER THIS SECTION INCLUDES PIPE MATERIALS, MANHOLES, AND APPURTENANCES, INCLUDING EXCAVATING AND BACKFILLING, NORMALLY ENCOUNTERED WITH SANITARY SEWER EXTENSIONS AND SANITARY BUILDING PIPING (LATERAL) FROM 3 FEET OUTSIDE BUILDING TO CONNECTION WITH MUNICIPAL SEWERS OR OTHER DISCHARGE SYSTEM OR METHOD. THE ENDS OF SEWERS SHALL BE TIGHTLY PLUGGED OR CAPPED AT THE TERMINAL POINTS, ADJACENT TO BUILDINGS, PENDING THE CONNECTING OF ALL SUCH LINES TO THE BUILDING DRAIN AS SPECIFIED IN THE PLUMBING SPECIFICATIONS AND ARCHITECTURAL DRAWINGS. ONE SET OF APPROVED PLANS SHALL BE ON THE JOB SITE AT ALL TIMES.

THIS SECTION INCLUDES, BUT IS NOT LIMITED TO:
1. EXCAVATION
2. EMBEDMENT AND BACKFILL
3. GRAVITY SANITARY SEWER PIPE
4. GRAVITY LATERAL PIPES
5. PRESSURE PIPE
6. MANHOLES
7. APPURTENANCES
8. DETAILS

1.2 DEFINITIONS
BEDDING: FILL PLACED UNDER, BESIDE, AND DIRECTLY OVER PIPE, PRIOR TO SUBSEQUENT BACKFILL OPERATIONS.

CONTRACTOR: COMPANY OR INDIVIDUAL AUTHORIZED BY HCRSD TO PERFORM WORK AS CALLED FOR BY ISSUANCE OF A SEWER CONSTRUCTION PERMIT.

DEVELOPER: ANY PUBLIC AGENCY, PRIVATE COMPANY, OR INDIVIDUAL WHO PROPOSES THE DEVELOPMENT OF PROPERTY WHICH REQUIRES CONSTRUCTION OF SANITARY SEWERS OR LATERALS.

DISTRICT: THE HENDRICKS COUNTY REGIONAL SEWER DISTRICT AND ITS REPRESENTATIVES: AQUA INDIANA, HENDRICKS COUNTY REGIONAL SEWER DISTRICT OPERATOR; AND AMERICAN STRUCTUREPOINT, INC., HENDRICKS COUNTY REGIONAL SEWER DISTRICT ENGINEER

EMBEDMENT: EARTH OR OTHER SPECIAL MATERIAL USED TO REPLACE MATERIAL REMOVED FROM TRENCHES DURING CONSTRUCTION FROM THE SEWER SUBGRADE.

MAIN SEWER: REFERS TO ANY EXISTING OR PROPOSED SEWER DEDICATED TO PUBLIC USE WITHIN THE PUBLIC RIGHT-OF-WAY OR EASEMENT.

LATERAL: REFERS TO ANY EXISTING OR PROPOSED PIPE WHICH CONNECTS FROM THE BUILDING PLUMBING TO THE MAIN SEWER.

1.3 ABBREVIATIONS
DI: DUCTILE IRON PIPE
HCRSD: HENDRICKS COUNTY REGIONAL SEWER DISTRICT
IDEM: INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
PVC: POLYVINYL CHLORIDE PLASTIC
SDR: STANDARD DIMENSION RATIO
HDPE: HIGH DENSITY POLYETHYLENE
CCTV: CLOSED CIRCUIT TELEVISION
IAC: INDIANA ADMINISTRATIVE CODE

1.4 DELIVERY, STORAGE, AND HANDLING
STORE PLASTIC PIPING PROTECTED FROM DIRECT SUNLIGHT AND SUPPORT TO PREVENT SAGGING AND BENDING. PROTECT STORED PIPING FROM MOISTURE AND DIRT BY ELEVATING ABOVE GRADE. PROTECT FLANGES, FITTINGS, AND SPECIALTIES FROM MOISTURE AND DIRT.

HANDLE MANHOLES ACCORDING TO MANUFACTURER'S WRITTEN RIGGING INSTRUCTIONS.

1.5 REFERENCE STANDARDS
THE PUBLICATIONS LISTED BELOW FORM A PART OF THIS SPECIFICATION TO THE EXTENT REFERENCED. THE PUBLICATIONS ARE REFERENCED IN THE TEXT BY THE BASIC DESIGNATION ONLY. MOST RECENT STANDARDS APPLY.
A. ASTM INTERNATIONAL:
1. ASTM C443 - STANDARD SPECIFICATION FOR JOINTS FOR CONCRETE PIPE AND MANHOLES, USING RUBBER GASKETS
2. ASTM D1785 - STANDARD SPECIFICATION FOR POLY(VINYL CHLORIDE) (PVC) PLASTIC PIPE, SCHEDULES 40, 80, AND 120.
3. ASTM D2564 - STANDARD SPECIFICATION FOR SOLVENT CEMENTS FOR POLY(VINYL CHLORIDE) (PVC) PLASTIC PIPING SYSTEMS.
4. ASTM D2729 - STANDARD SPECIFICATION FOR POLY(VINYL CHLORIDE) (PVC) SEWER PIPE AND FITTINGS.
5. ASTM D2855 - STANDARD PRACTICE FOR MAKING SOLVENT-CEMENTED JOINTS WITH POLY(VINYL CHLORIDE) (PVC) PIPE AND FITTINGS.
6. ASTM D3034 - STANDARD SPECIFICATION FOR TYPE PSM POLY(VINYL CHLORIDE) (PVC) SEWER PIPE AND FITTINGS.
7. ASTM D6938 - STANDARD TEST METHOD FOR IN-PLACE DENSITY AND WATER CONTENT OF SOIL AND SOIL-AGGREGATE BY NUCLEAR METHODS (SHALLOW DEPTH).
B. ASTM F477 - STANDARD SPECIFICATION FOR ELASTOMERIC SEALS (GASKETS) FOR JOINING PLASTIC PIPE.
C. AMERICAN WATER WORKS ASSOCIATION (AWWA):
1. AWWA C111 - RUBBER-GASKET JOINTS FOR DUCTILE-IRON PRESSURE PIPE AND FITTINGS.
2. AWWA C150 - THICKNESS DESIGN OF DUCTILE-IRON PIPE.
3. AWWA C151 - DUCTILE-IRON PIPE, CENTRIFUGALLY CAST.

1.6 COORDINATION
1. COORDINATE CONNECTION TO SANITARY SEWER MAIN WITH HCRSD. A HCRSD REPRESENTATIVE MUST BE NOTIFIED A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION STARTUP.

1.7 EASEMENTS
A. MINIMUM EASEMENT WIDTH IS 20 FEET WITH THE SEWER CENTERED IN THE EASEMENT. THE EASEMENT SHALL BE DEDICATED TO THE UTILITY.

DEPTH OF SEWER	EASEMENT WIDTH (FEET)
UP TO 15 FEET	20
15 – 20 FEET	25
20 – 25 FEET	30
25 – 35 FEET	40
OVER 35 FEET	50

B. A MINIMUM OF TWENTY (20) FEET OF HORIZONTAL SEPARATION (AS MEASURED HORIZONTALLY FROM THE SEWER SPRING LINE) MUST BE MAINTAINED BETWEEN GRAVITY SEWERS AND THE TOP OF BANK OF ALL WATER WAYS, BODIES OF WATER AND DRY DETENTION AREAS.
C. WHEN CROSSING A WATERWAY, THE SANITARY SEWER FACILITIES SHOULD BE DESIGNED TO CROSS AS CLOSE TO NINETY (90) DEGREES AS POSSIBLE. THE UTILITY WILL NOT PERMIT THE CROSSING OF BODIES OF WATER INCLUDING, LAKES AND RETENTION/DETENTION PONDS OR DRY DETENTION AREAS.

1.8 CLOSEOUT SUBMITTALS
1. PROJECT RECORD DOCUMENTS: SUBMITTALS OF PROJECT RECORD DOCUMENTS SHALL CONFORM TO THE HENDRICKS COUNTY REGIONAL SEWER DISTRICT DIGITAL SUBMISSION STANDARDS, LATEST VERSION.
2. COMPLETE TRANSFER OF ASSETS DOCUMENTATION (FOR SEWER MAIN EXTENSIONS ONLY).
3. PROVIDE HCRSD WITH COPY OF ANY EASEMENTS, PLATTED OR RECORDED.
4. DELIVER TO HCRSD THE CCTV RECORDINGS OF THE COMPLETED SEWER (FOR SEWER MAIN EXTENSIONS ONLY).
5. PROVIDE HCRSD WITH THE SEWER MANHOLE AND PIPE TEST RESULTS.
6. COMPLETE FINAL INSPECTION WITH A HCRSD REPRESENTATIVE.

PART 2 – PRODUCTS

2.1 EXCAVATION
A. DESCRIPTION
1. THE CONTRACTOR SHALL CONSTRUCT ALL EARTH EXCAVATIONS TO THE WIDTHS AND DEPTHS DETAILED IN THE DRAWINGS. EXCAVATION SHALL INCLUDE ALL KINDS OF MATERIALS, WET AND/OR DRY, EXCAVATED, OR WHICH ARE TO BE EXCAVATED, INCLUDING ROCK, SHALE, HARDPAN, MUCK, ETC.
2. EXCAVATION INCLUDES ALL EXCAVATION, SURFACE REMOVAL, CLEARING, DISPOSAL OF SURPLUS MATERIAL, DEWATERING, BORING AND JACKING, AND ALL OTHER WORK INCIDENTAL TO THE CONSTRUCTION OF TRENCHES OR TRENCHLESS MEANS FOR PIPE INSTALLATION. EXCAVATION ALSO INCLUDES THE SAME ACTIVITIES RELATED TO THE INSTALLATION OF MANHOLES OR OTHER REQUIRED STRUCTURES.
3. THE DEVELOPER AND HIS OR HER CONTRACTOR SHALL BE RESPONSIBLE FOR ASSURING THE PROTECTION OF ALL EXISTING IMPROVEMENTS, BOTH PUBLIC AND PRIVATE. THE HCRSD SHALL BE HELD HARMLESS FROM ANY AND ALL DAMAGES TO SAID EXISTING IMPROVEMENTS DURING THE CONSTRUCTION OF THE IMPROVEMENTS.
4. COMPLIANCE WITH THESE SPECIFICATIONS DOES NOT ELIMINATE THE NEED TO COMPLY WITH OTHER APPLICABLE CITY, COUNTY, STATE AND FEDERAL ORDINANCES, REGULATIONS, AND CONSTRUCTION REQUIREMENTS. THIS INCLUDES, BUT IS NOT LIMITED TO CODES AND STANDARDS ISSUED BY IDEM, INDOT, OR OTHER GOVERNMENTAL AGENCIES.
5. THE PROVISIONS OF THIS DOCUMENT SHALL BE DEEMED AS ADDITIONAL REQUIREMENTS TO MINIMUM STANDARDS REQUIRED BY OTHER APPLICABLE ORDINANCES AND STANDARDS. IN THE CASE OF CONFLICTING REQUIREMENTS, THE MOST RESTRICTIVE SHALL APPLY.

2.2 EMBEDMENT AND BACKFILL
A. DESCRIPTION
1. ALL TRENCHES OR EXCAVATIONS SHALL BE BACKFILLED TO THE ORIGINAL SURFACE OF THE GROUND OR SUCH OTHER GRADES AS SHOWN ON THE DRAWINGS. IN GENERAL, BACKFILLING OPERATIONS SHALL BE CARRIED ALONG AS SPEEDILY AS POSSIBLE AND AS SOON AS THE PIPE HAS BEEN LAID AND BEDDING HAS BEEN PLACED.
B. DEFINITIONS AND GENERAL CONSIDERATIONS
1. PIPE BEDDING SHALL BE CONSIDERED THE AREA USED FOR SUPPORT DIRECTLY UNDER THE PIPE FOR THE FULL WIDTH OF THE TRENCH. THE HAUNCH IS THE AREA FROM THE TOP OF THE BEDDING TO THE SPRINGLINE (HORIZONTAL CENTERLINE OF THE PIPE) FOR THE FULL WIDTH OF THE TRENCH. INITIAL BACKFILL IS THE AREA FROM THE SPRINGLINE TO TWELVE (12") INCHES ABOVE THE CROWN (TOP) OF THE PIPE. PIPE EMBEDMENT IS THE TOTAL AREA THAT INCLUDES THE BEDDING, HAUNCH AND INITIAL BACKFILL. THE FINAL BACKFILL IS ALL OF THE AREA ABOVE THE TOP OF THE INITIAL BACKFILL ELEVATION.
2. SPECIAL FOUNDATION MATERIAL MAY BE REQUIRED UNDER THE PIPE BEDDING FOR AREAS OF UNSTABLE SOIL MATERIAL IN CIRCUMSTANCES WHERE UNSTABLE SOIL MATERIAL IS ENCOUNTERED, THE AREA SHALL BE EXCAVATED AND REPLACED WITH SUITABLE CRUSHED STONE TO FORM A SOUND FOUNDATION. THE PIPE BEDDING CAN THEN BE PLACED UPON THE FOUNDATION MATERIAL.
3. THE CONTRACTOR SHALL NOT PLACE PIPE EMBEDMENT MATERIALS BY METHODS THAT WILL DAMAGE OR DISTURB THE PIPE OR OTHER UTILITIES. CARE SHALL BE TAKEN THAT COMPACTION EQUIPMENT DOES NOT COME INTO CONTACT WITH THE PIPE. PRIOR TO PERFORMING COMPACTION OPERATION OVER THE PIPE, THE CONTRACTOR MUST ENSURE THAT SUFFICIENT BACKFILL IS INSTALLED OVER THE PIPE TO PREVENT DAMAGE OR EXCESSIVE DEFLECTION.
C. BEDDING AND BACKFILL OF TRENCH EXCAVATIONS FOR PIPES AND CONDUITS
1. BEDDING AND BACKFILL MATERIALS FOR PIPE INSTALLATION AND TRENCH BACKFILL SHALL CONFORM TO THE TYPES DETAILED IN PART 3 OF THIS SPECIFICATION FOR THE SPECIFIC PIPE TYPE INSTALLED.
D. STRUCTURAL BACKFILL
1. BACKFILL MATERIALS FOR BACKFILL OF STRUCTURES OTHER THAN PIPES AND CONDUITS SHALL BE ACCORDING THE STANDARD DETAILS.

2.3 GRAVITY SANITARY SEWER PIPE
A. DESCRIPTION
1. THE CONTRACTOR SHALL FURNISH AND LAY SEWER PIPE, AND ALL ACCESSORIES, TO THE LINES AND GRADES SHOWN ON THE DRAWINGS. SEWER PIPE SHALL BE CONSTRUCTED OF THE PIPE MATERIALS AS SPECIFIED HEREIN AND AS SHOWN ON THE DRAWINGS.
2. RELATED WORK DESCRIBED ELSEWHERE:
A. EXCAVATION
B. EMBEDMENT AND BACKFILL
B. QUALITY ASSURANCE
1. CODES AND STANDARDS
A. EACH LENGTH OF PIPE SHALL BE MARKED PER THE REQUIREMENTS OF THE RESPECTIVE ASTM STANDARD.
B. ALL CODES AND STANDARDS SHALL BE SET FORTH IN THE LATEST ASTM STANDARD.
2. UPON REQUEST BY THE HCRSD, THE CONTRACTOR SHALL FURNISH COPIES OF ALL MATERIAL TESTS REQUIRED BY THE APPLICABLE ASTM STANDARD.
3. MAXIMUM ALLOWED INFILTRATION IN NEW GRAVITY SANITARY SEWERS SHALL BE 100 GALLONS PER 24 HOUR PERIOD PER INCH-DIAMETER-MILE.
C. POLYVINYL CHLORIDE (PVC) PIPE, SDR-35, SDR-26, OR SDR-21
1. MATERIAL
A. POLYVINYL CHLORIDE (PVC) FOR GRAVITY SANITARY SEWER PIPE SHALL BE THE INTEGRAL WALL BELL AND SPIGOT TYPE WITH ELASTOMERIC SEAL JOINTS AND SMOOTH INNER WALLS MEETING OR EXCEEDING ALL OF THE REQUIREMENTS SET FORTH IN ASTM D-3034 FOR PIPE DIAMETERS 15-INCHES OR LESS.
B. FOR DIAMETERS 15-INCHES OR LESS, THE PIPE SHALL HAVE A MINIMUM CELL CLASSIFICATION OF 12454 OR 12364; WITH ALL PIPE HAVING A MINIMUM TENSILE STRENGTH OF 34.50 MPA AS DEFINED IN ASTM D-1784.
C. PVC SANITARY SEWER PIPE SHALL HAVE A MINIMUM PIPE STIFFNESS OF 46 PSI FOR SDR 35 AND 115 PSI FOR SDR 26 FOR EACH DIAMETER, WHEN MEASURED AT 5% VERTICAL RING DEFLECTION AND TESTED IN ACCORDANCE WITH ASTM D-2412.
D. SDR-35 MAY BE USED FOR PIPE DEPTHS LESS THAN 15-FEET AND SDR-26 SHALL BE USED FOR PIPE DEPTHS GREATER THAN 15-FEET.
E. FOR PIPE INSTALLATION WHERE THE SEWER IS CLOSER THAN 51 FEET TO A RESIDENTIAL WATER WELL, THE SEWER SHALL BE CONSTRUCTED FROM SDR-21 IN ACCORDANCE WITH ASTM D-2241, WITH A MINIMUM CELL CLASS OF 12454.
2. JOINTS
A. FLEXIBLE GASKET JOINTS SHALL BE COMPRESSION TYPE SO THAT WHEN ASSEMBLED, THE GASKET INSIDE THE BELL WILL BE COMPRESSED RADIALLY ON THE PIPE SPIGOT TO FORM A WATERTIGHT SEAL. THE ASSEMBLY OF JOINTS SHALL BE IN ACCORDANCE WITH THE PIPE MANUFACTURER'S RECOMMENDATIONS AND ASTM D-3212 FOR PIPE CONFORMING TO ASTM D-3034 OR JOINTS SHALL MEET THE REQUIREMENTS OF ASTM D-3139 FOR PIPE CONFORMING TO ASTM D-2241. THE GASKETS SEALING THE JOINT SHALL BE MADE OF RUBBER OF SPECIAL COMPOSITION HAVING A TEXTURE TO ASSURE A WATERTIGHT AND PERMANENT SEAL AND SHALL BE THE PRODUCT OF A MANUFACTURER HAVING AT LEAST FIVE (5) YEARS OF EXPERIENCE IN THE MANUFACTURE OF RUBBER GASKETS FOR PIPE JOINTS. THE GASKET SHALL BE A CONTINUOUS RING OF FLEXIBLE JOINT RUBBER OF A COMPOSITION AND TEXTURE WHICH IS RESISTANT TO COMMON INGREDIENTS OF SEWAGE, INDUSTRIAL WASTES AND GROUNDWATER AND WHICH WILL ENDURE PERMANENTLY UNDER THE CONDITIONS IMPOSED BY THIS SERVICE. THE GASKET SHALL CONFORM TO THE REQUIREMENTS OF ASTM F-477.
B. NO SOLVENT CEMENT JOINTS SHALL BE ALLOWED.
C. ALL FIELD-CUTTING OF PIPE SHALL BE DONE IN A NEAT MANNER AS PER MANUFACTURER'S RECOMMENDATIONS AND THE CUT END SHALL BE BEVELED USING A FILE OR WHEEL TO PRODUCE A SMOOTH BEVEL OF APPROXIMATELY 15° AND BE A MINIMUM DEPTH OF ONE- THIRD THE PIPE WALL THICKNESS. FIELD CUT PIPE WILL ONLY BE ALLOWED TO BE INSTALLED AT MANHOLES, AT PREFABRICATED TEES AND WYES, AND AT THE CONNECTION OF NEW SANITARY SEWER TO EXISTING SANITARY SEWER.
3. FITTINGS
A. ALL PIPE FITTINGS SHALL BE MANUFACTURED IN ACCORDANCE WITH THE LATEST ASTM D-3034 AND ASTM F-679 STANDARDS AND SHALL HAVE A MINIMUM PIPE STIFFNESS OF 46 PSI FOR SDR 35 AND 115 PSI FOR SDR 26 IN ALL DIRECTIONS. THE MINIMUM CELL CLASSIFICATION SHALL BE 12454 OR 12364 PER THE LATEST ASTM D-1784 STANDARD. ALL FITTINGS SHALL BE "HEAVY WALL" AND PROVIDED GASKETS MEETING OR EXCEEDING THE STANDARDS FOR THE PIPE.
B. ALL SEWER MAIN LATERAL CONNECTIONS SHALL BE PRE-FABRICATED WYE FITTINGS. ALL PIPE FITTINGS SHALL BE INJECTION MOLDED UNLESS PRIOR AUTHORIZATION IS GRANTED BY THE HCRSD.
C. SADDLE CONNECTIONS SHALL NOT BE ALLOWED FOR NEW CONSTRUCTION. FOR INSTALLATION OF A NEW LATERAL ON EXISTING SEWERS, CONNECTION WITH A SADDLE MAY BE CONSIDERED ON PIPE 10-INCHES IN DIAMETER AND LARGER.
4. DESIGN
A. THE MINIMUM WALL THICKNESS FOR PVC SEWER PIPE AND LATERAL SEWER PIPE 15- INCHES OR LESS IN DIAMETER SHALL CONFORM TO SDR-35, SDR-26, OR SDR-21 AS SPECIFIED IN ASTM D-3034 OR ASTM D-2241.
5. MARKINGS
A. THE DATE OF MANUFACTURE, SHIFT CODE, CLASS OF PIPE, ASTM SPECIFICATION DESIGNATION (E.G. "PVC-SDR-26"), SIZE OF PIPE, NAME OR TRADEMARK OF MANUFACTURER, AND IDENTIFICATION OF PLANT/LOCATION SHALL BE LEGIBLY MARKED ON THE OUTSIDE OF EACH PIPE SECTION AND FITTING IN ACCORDANCE WITH THE ASTM D-3034.
6. CERTIFICATION
A. THE CONTRACTOR SHALL FURNISH, UPON REQUEST, CERTIFIED REPORTS STATING THAT INSPECTION AND SPECIFIED TESTS HAVE BEEN MADE AND THAT THE RESULTS THEREOF COMPLY WITH THE APPLICABLE STANDARDS.
D. POLYVINYL CHLORIDE (PVC) PIPE, C-900/C-905
1. PIPE
A. PVC GRAVITY SEWER MAIN PIPE SHALL CONFORM TO ASTM SPECIFICATION D-2241, STANDARD SPECIFICATION FOR POLYVINYL CHLORIDE (PVC) PLASTIC PIPE (SDR PR). THE MATERIAL USED SHALL CONFORM TO ASTM SPECIFICATION D-1784, STANDARD SPECIFICATION OF RIGID POLYVINYL CHLORIDE AND CHLORINATED POLYVINYL CHLORIDE COMPOUNDS, CLASS 12454. THE MINIMUM PRESSURE CLASS FOR A STREAM CROSSING SHALL BE CLASS 200.
B. THE PIPE FITTINGS SHALL BE PRESSURE RATED IN ACCORDANCE WITH RECOMMENDATIONS OF THE PLASTIC PIPE INSTITUTE.
C. PVC GRAVITY SEWER MAIN SHALL BE IN COMPLIANCE WITH AWWA C-900 FOR 4" THROUGH 12" AND AWWA C-905 FOR 14" AND GREATER. THE MINIMUM DIMENSION RATIO SHALL BE DR18 WITH A PRESSURE RATING OF 235 PSI.
D. ALL PLASTIC PIPE AND COUPLINGS SHALL BEAR IDENTIFICATION MARKINGS IN ACCORDANCE WITH SECTION 2.5.2 AND 2.5.3 OF AWWA C-900, WHICH SHALL INCLUDE THE NATIONAL SANITATION FOUNDATION (NSF) SEAL OF APPROVAL. IN ADDITION, THE PLAIN END OF EACH PIPE LENGTH SHALL HAVE TWO (2) RINGS, ONE INCH (1") APART, PAINTED AROUND THE PIPE AT THE PROPER LOCATION TO ALLOW FIELD CHECKING OF THE CORRECT SETTING DEPTH OF THE PIPE IN THE BELL OR COUPLING.
2. JOINTS
A. JOINTS SHALL BE BELL END OR COUPLING PUSH-ON TYPE.
B. THE PUSH-ON JOINT AND JOINT COMPOUNDS SHALL MEET THE REQUIREMENTS FOR ASTM SPECIFICATION D-3139, JOINT FOR THE PLASTIC PIPE, USING FLEXIBLE ELASTOMERIC SEALS. THE JOINT SHALL BE DESIGNED SO AS TO PROVIDE FOR THE THERMAL EXPANSION AND CONTRACTION EXPERIENCED WITH A TOTAL TEMPERATURE CHANGE OF SEVENTY-FIVE (75) DEGREES F IN EACH JOINT OF PIPE. DETAILS OF THE JOINT DESIGN AND ASSEMBLY SHALL BE IN ACCORDANCE WITH JOINT MANUFACTURER'S STANDARD PRACTICE.
C. THE LUBRICANT SHALL HAVE NO DETERIORATING EFFECTS ON THE GASKET OR THE PIPE. THE LUBRICANT CONTAINERS SHALL BE LABELED WITH MANUFACTURER'S NAME.
D. THE GASKETS SEALING THE JOINT SHALL BE MADE OF RUBBER OF SPECIAL COMPOSITION HAVING A TEXTURE TO ASSURE A WATERTIGHT AND PERMANENT SEAL AND SHALL BE THE PRODUCT OF A MANUFACTURER HAVING AT LEAST FIVE (5) YEARS OF EXPERIENCE IN THE MANUFACTURE OF RUBBER GASKETS FOR PIPE JOINTS. THE GASKET SHALL BE A CONTINUOUS RING OF FLEXIBLE JOINT RUBBER OF A COMPOSITION AND TEXTURE WHICH IS RESISTANT TO COMMON INGREDIENTS OF SEWAGE, INDUSTRIAL WASTES AND GROUNDWATER AND WHICH WILL ENDURE PERMANENTLY UNDER THE CONDITIONS IMPOSED BY THIS SERVICE. THE GASKET SHALL CONFORM TO ASTM F-477. GASKETS SHALL MEET ALL APPLICABLE REQUIREMENTS OF ANSI STANDARD A- 21.11.
3. FITTINGS
A. FITTINGS SHALL BE MANUFACTURED IN ONE PIECE OF INJECTION MOLDED PVC COMPOUND MEETING THE REQUIREMENTS OF ASTM D1784. FITTINGS SHALL BE DESIGNED TO WITHSTAND A MINIMUM OF 755 PSI QUICK BURST PRESSURE @ 73 DEGREES F IN ACCORDANCE WITH ASTM D1599.
B. ALL SEWER MAIN LATERAL CONNECTIONS SHALL BE PRE-FABRICATED WYE FITTINGS TO FIT C900 PIPE. ALL PIPE FITTINGS SHALL BE INJECTION MOLDED UNLESS PRIOR AUTHORIZATION IS GRANTED BY THE HCRSD.
4. MARKINGS
A. THE DATE OF MANUFACTURE, SHIFT CODE, CLASS OF PIPE, ASTM SPECIFICATION DESIGNATION (E.G. "PVC-C900"), SIZE OF PIPE, NAME OR TRADEMARK OF MANUFACTURER, AND IDENTIFICATION OF PLANT/LOCATION SHALL BE LEGIBLY MARKED ON THE OUTSIDE OF EACH PIPE SECTION AND FITTING IN ACCORDANCE WITH THE ASTM D-3034.
5. CERTIFICATION
A. THE CONTRACTOR SHALL FURNISH, UPON REQUEST, CERTIFIED REPORTS STATING THAT INSPECTION AND SPECIFIED TESTS HAVE BEEN MADE AND THAT THE RESULTS THEREOF COMPLY WITH THE APPLICABLE STANDARDS.
E. NON-PRESSURE TYPE TRANSITION COUPLINGS:
1. COMPLY WITH ASTM C1173, ELASTOMERIC, SLEEVE TYPE, REDUCING OR TRANSITION COUPLING, FOR JOINING UNDERGROUND NONPRESSURE PIPING. INCLUDE ENDS TO MATCH SAME SIZES OF MAIN LINE PIPING AND INSTALL CORROSION-RESISTANT METAL TENSION BANDS AND TIGHTENING MECHANISM ON EACH END.
2. SLEEVE MATERIALS:
A. FOR PLASTIC PIPES: ASTM F477, ELASTOMERIC SEAL.
B. FOR DISSIMILAR PIPES: PVC OR OTHER MATERIAL COMPATIBLE WITH PIPE MATERIALS BEING JOINED.
3. NON-SHEAR, FLEXIBLE COUPLINGS:
A. COUPLINGS SHALL BE ELASTOMERIC SLEEVE WITH STAINLESS STEEL SHEAR RING AND CORROSION-RESISTANT-METAL TENSION BAND AND TIGHTENING MECHANISM ON EACH END.
F. LATERALS
1. LATERALS AND TEE-WYES SHALL BE 6-INCH PVC SDR 26 LAID AT A MINIMUM OF 1.00% SLOPE FROM THE SEWER MAIN TO THE RIGHT OF WAY LINE (OR EASEMENT LINE).
2. EACH PROPERTY HAVING A SEPARATE PROPERTY OWNER SHALL HAVE ITS OWN LATERAL FROM THE BUILDING TO THE MAINLINE SEWER.
3. LATERAL CONNECTIONS SHALL ONLY OCCUR AT TEE-WYES.
4. EXCEPT AS PROVIDED IN A WRITTEN APPROVAL ISSUED BY THE DISTRICT OR ITS REPRESENTATIVES, NO PERSON SHALL CONNECT A LATERAL TO A SANITARY SEWER WHEN THE LATERAL HAS ANY OF THE FOLLOWING SOURCES OF CLEAR WATER:
A. FOUNDATION/FOOTING DRAINS;
B. SUMP PUMPS WITH OR WITHOUT FOUNDATION DRAINS CONNECTED;
C. ROOF DRAINS;
D. HEAT PUMP DISCHARGE;
E. COOLING WATER; OR
F. ANY OTHER SOURCES OF CLEAR WATER, SUCH AS, BUT NOT LIMITED TO, YARD AND / OR DRIVEWAY DRAINS.
5. BASEMENTS
A. HCRSD DOES NOT ALLOW ANY DIRECT BASEMENT CONNECTIONS TO A GRAVITY LATERAL.
B. ALL BUILDINGS CONSTRUCTED WITH A BASEMENT (BELOW GROUND LEVEL) SHALL USE A SUMP PIT AND SEWAGE EJECTOR PUMP ARRANGEMENT TO LIFT THE SEWAGE ABOVE THE OUTSIDE GRADE RELATIVE TO THE DIRECTION AND LOCATION OF THE SANITARY SEWER MAIN (OVERHEAD SEWER). ALL PIPING SHALL BE ARRANGED AS TO PRECLUDE THE PUMP FROM PUMPING SEWAGE TO AN UPPER LEVEL WHEN THE PUMP IS PUMPING AGAINST A HEAD (BLOCKED SEWER MAIN OR LATERAL).
C. A CHECK VALVE SUITABLE FOR THE PIPE MATERIAL BEING USED SHALL BE INSTALLED HORIZONTALLY IN THE DOWNSTREAM PIPING OF THE EJECTOR PUMP PRIOR TO DISCHARGE INTO THE HOUSE GRAVITY LATERAL. THE CHECK VALVE SHALL BE ABLE TO WITHSTAND NORMAL PUMPING PRESSURE AND WATER HAMMER. THE CHECK VALVE SHALL BE ACCESSIBLE FOR NORMAL MAINTENANCE. A BALL-TYPE SHUT-OFF VALVE SHALL BE INSTALLED ON BOTH DOWNSTREAM AND UPSTREAM SIDE OF THE CHECK VALVE FOR EASE OF MAINTENANCE.
6. GENERALLY, HCRSD DOES NOT ALLOW LATERAL CONNECTIONS TO A SEWER BEYOND THOSE INSTALLED DURING ORIGINAL CONSTRUCTION. LATERALS MUST CONNECT TO THE SANITARY SEWER ONLY AT MANUFACTURED FITTINGS (EXCEPT AS OTHERWISE PERMITTED BY THESE DESIGN SPECIFICATIONS). A "SADDLE" CONNECTION TO THE SANITARY SEWER WILL BE ALLOWED IF APPROVED BY THE DISTRICT IN WRITING.
A. THE SEWER PIPE SADDLE SHALL BE ROMAC INDUSTRIES, INC. STYLE "CB" SEWER SADDLE OR APPROVED EQUAL.
7. LATERALS CANNOT CONNECT DIRECTLY INTO A MANHOLE, EXCEPT AS FOLLOWS:
A. APPROVED BY HCRSD IN WRITING.
B. ON DEEP LINES (GREATER THAN TWELVE (12) FEET) OR INTERCEPTORS GREATER THAN TEN (10) INCHES IN DIAMETER.
C. ON BUILDINGS IN WHICH HCRSD MAY WISH TO FLOW MONITOR OR SAMPLE FLOW CHARACTERISTICS.
D. ON BUILDINGS IN WHICH ADDITIONAL ACCESS TO THE LATERAL WOULD BE HELPFUL. FOR EXAMPLE, SCHOOLS.
8. DURING CONSTRUCTION OF THE MAIN LINE SEWER, LATERALS MUST TERMINATE WITHIN A SANITARY SEWER OR UTILITY EASEMENT AND BE SEALED WITH A MANUFACTURED CAP/PLUG MADE SPECIFICALLY FOR THE PURPOSED OF SEALING/CAPPING THE END OF THE SANITARY SEWER TO ENSURE 100% WATER TIGHTNESS. THE TERMINATION POINT MUST BE A MINIMUM OF FIVE (5) FEET FROM THE BUILDING LINE.
9. ALL PVC FITTINGS MUST BE ASTM D-3034 SDR-26 HEAVY WALL MINIMUM. BELL TO SPIGOT FITTINGS MAY ONLY BE APPROVED BY THE DISTRICT.
G. CLEANOUTS
1. PVC CLEANOUTS:
A. PVC BODY WITH PVC THREADED PLUG: CLEANOUT SHALL BE AS PER ASTM D3034. PVC SEWER PIPE FITTING AND RISER TO CLEANOUT.
B. CLEANOUT SHALL BE INSTALLED AT A MINIMUM OF 3 FEET FROM THE OUTSIDE OF BUILDING WALL AND EVERY 100 FEET OF LATERAL UNTIL CONNECTION AT THE MAINLINE SEWER.
C. CLEANOUT RISER: SEWER PIPE FITTING ON MAIN LINE SEWER AND RISER SHALL MATCH MAIN LINE PIPING.
D. CLEANOUT SHUT-OFF VALVE: A CLEANOUT VALVE SHALL BE PROVIDED, SEWUR VALVE OR APPROVED EQUAL.

2.4 PRESSURE PIPE
A. DESCRIPTION
1. THE CONTRACTOR SHALL FURNISH AND LAY, AS REQUIRED, SANITARY PRESSURE PIPE, TOGETHER WITH ALL FITTINGS, THRUST BLOCKING OR OTHER INCIDENTALS AS SHOWN ON THE APPROVED PLANS OR SPECIFIED AND, NECESSARY TO COMPLETE THE WORK. SANITARY PRESSURE PIPE SHALL BE CONSTRUCTED OF THE PIPE MATERIALS AS SPECIFIED HEREIN.
2. ALL SANITARY PRESSURE PIPES TO BE FURNISHED UNDER THIS CONTRACT SHALL CONFORM TO SPECIFICATIONS OF THIS SECTION.
3. PRESSURE PIPE MAY BE INSTALLED BY THE HORIZONTAL DIRECTIONAL DRILLING (HDD) METHOD.
4. RELATED WORK DESCRIBED ELSEWHERE:
A. EXCAVATION
B. EMBEDMENT AND BACKFILL
5. FLOW FROM PRESSURE PIPES SHALL BE DIRECTED TOWARDS THE OUTLET PIPE WITHIN THE DISCHARGE MANHOLE. MODIFICATIONS TO THE BENCH MAY BE NECESSARY.
6. NO PUBLIC FORCE MAIN WILL BE LESS THAN FOUR (4) INCHES IN DIAMETER, EXCEPT IN A LOW PRESSURE TYPE GRINDER PUMP COLLECTION SYSTEM APPROVED BY THE UTILITY.
7. VELOCITIES

B. PVC FORCE MAIN PIPE MATERIAL SHALL CONFORM TO ASTM SPECIFICATION D-1784, STANDARD SPECIFICATION OF RIGID POLYVINYL CHLORIDE AND CHLORINATED POLYVINYL CHLORIDE COMPOUNDS, CELL CLASS 12454 (PVC 1120).
C. FOR ASTM D2241, THE MATERIAL SHALL CONFORM TO ASTM D1784, CELL CLASS 12454 AND HYDROSTATIC DESIGN STRESS OF 2000 PSI. THE MINIMUM PRESSURE CLASS/SDR RATING SHALL BE CLASS 200/SDR 21.
D. FOR AWWA C900, THE MATERIAL SHALL HAVE A DESIGN BASIS OF 4000 PSI AND THE MINIMUM PRESSURE CLASS/DR RATING SHALL BE CLASS 200/DR 14.
E. FOR AWWA C905, THE MATERIAL SHALL HAVE A HYDROSTATIC DESIGN BASIS OF 4000 PSI AND THE MINIMUM PRESSURE CLASS/DR RATING ACCEPTABLE SHALL BE CLASS 200/DR 21.
F. PVC FORCE MAIN SHALL BE IN COMPLIANCE WITH AWWA C-900 FOR 4" THROUGH 12" AND AWWA C-905 FOR 14" AND GREATER.
G. ALL PLASTIC PIPE AND COUPLINGS SHALL BEAR IDENTIFICATION MARKINGS IN ACCORDANCE WITH SECTION 2.5.2 AND 2.5.3 OF AWWA C-900, WHICH SHALL INCLUDE THE NATIONAL SANITATION FOUNDATION (NSF) SEAL OF APPROVAL. IN ADDITION, THE PLAIN END OF EACH PIPE LENGTH SHALL HAVE TWO (2) RINGS, ONE INCH (1") APART, PAINTED AROUND THE PIPE AT THE PROPER LOCATION TO ALLOW FIELD CHECKING OF THE CORRECT SETTING DEPTH OF THE PIPE IN THE BELL OR COUPLING.

2. JOINTS
A. JOINTS SHALL BE BELL END OR COUPLING PUSH-ON TYPE WITH JOINT RESTRAINTS AS NEEDED. JOINT RESTRAINTS SHALL BE MEGALUG STYLE MECHANICAL JOINTS FOR PVC PIPE AS MANUFACTURED BY EBAA IRON OR APPROVED EQUAL.
B. THE PUSH-ON JOINT AND JOINT COMPOUNDS SHALL MEET THE REQUIREMENTS FOR ASTM SPECIFICATION D-3139, JOINT FOR THE PLASTIC PIPE, USING FLEXIBLE ELASTOMERIC SEALS. THE JOINT SHALL BE DESIGNED SO AS TO PROVIDE FOR THE THERMAL EXPANSION AND CONTRACTION EXPERIENCED WITH A TOTAL TEMPERATURE CHANGE OF SEVENTY-FIVE (75) DEGREES F IN EACH JOINT OF PIPE. DETAILS OF THE JOINT DESIGN AND ASSEMBLY SHALL BE IN ACCORDANCE WITH JOINT MANUFACTURER'S STANDARD PRACTICE.
C. THE LUBRICANT SHALL HAVE NO DETERIORATING EFFECTS ON THE GASKET OR THE PIPE. THE LUBRICANT CONTAINERS SHALL BE LABELED WITH MANUFACTURER'S NAME.
D. THE GASKETS SEALING THE JOINT SHALL BE MADE OF RUBBER OF SPECIAL COMPOSITION HAVING A TEXTURE TO ASSURE A WATERTIGHT AND PERMANENT SEAL AND SHALL BE THE PRODUCT OF A MANUFACTURER HAVING AT LEAST FIVE (5) YEARS OF EXPERIENCE IN THE MANUFACTURE OF RUBBER GASKETS FOR PIPE JOINTS. THE GASKET SHALL BE A CONTINUOUS RING OF FLEXIBLE JOINT RUBBER OF A COMPOSITION AND TEXTURE WHICH IS RESISTANT TO COMMON INGREDIENTS OF SEWAGE, INDUSTRIAL WASTES AND GROUNDWATER AND WHICH WILL ENDURE PERMANENTLY UNDER THE CONDITIONS IMPOSED BY THIS SERVICE. THE GASKET SHALL CONFORM TO ASTM F-477. GASKETS SHALL MEET ALL APPLICABLE REQUIREMENTS OF ANSI STANDARD A- 21.11.

3. FITTINGS
A. FITTINGS SHALL BE MANUFACTURED IN ONE PIECE OF INJECTION MOLDED PVC COMPOUND MEETING THE REQUIREMENTS OF ASTM D1784. FITTINGS SHALL BE DESIGNED TO WITHSTAND A MINIMUM OF 755 PSI QUICK BURST PRESSURE @ 73 DEGREES F IN ACCORDANCE WITH ASTM D1599.
B. FOR RESTRAINED JOINTS, FITTINGS SHALL BE RESTRAINED JOINT DUCTILE IRON FITTINGS CONFORMING TO AWWA C110 AND AWWA C111.

4. LOCATING TRACING WIRE
A. ALL PVC PIPE FOR PRESSURE SANITARY SEWER SHALL BE INSTALLED WITH TRACING WIRE. TRACING WIRE SHALL BE 10 AWG SOLID COPPER HIGH STRENGTH TRACER WIRE, CCS REINFORCED BY COPPERHEAD OR APPROVED EQUAL.
B. LOCATING TRACER WIRE SHALL BE BROUGHT TO SURFACE NO LESS THAN EVERY 500 L.F.
C. LOCATE WIRE SHALL BE TESTED FOR CONTINUITY PRIOR TO ACCEPTANCE.

5. MARKINGS
A. THE DATE OF MANUFACTURE, SHIFT CODE, CLASS OF PIPE, ASTM SPECIFICATION DESIGNATION ("PVC-C900"), SIZE OF PIPE, NAME OR TRADEMARK OF MANUFACTURER, AND IDENTIFICATION OF PLANT/LOCATION SHALL BE LEGIBLY MARKED ON THE OUTSIDE OF EACH PIPE SECTION IN ACCORDANCE WITH THE ASTM D-3034.
B. WHERE C900/905 IS USED FOR SEWER FORCE MAIN, IT SHALL BE GREEN IN COLOR TO DESIGNATE IT IS SEWER, ALTERNATELY, A PLASTIC TAPE "SEWER" COMPLYING WITH 327 IAC MAY BE INSTALLED.

6. CERTIFICATION
A. THE CONTRACTOR SHALL FURNISH, UPON REQUEST, CERTIFIED REPORTS STATING THAT INSPECTION AND SPECIFIED TESTS HAVE BEEN MADE AND THAT THE RESULTS THEREOF COMPLY WITH THE APPLICABLE STANDARDS.

E. HIGH DENSITY POLYETHYLENE PIPE (HDPE)
1. PIPE
A. HDPE FORCE MAIN SHALL BE EXTRA HIGH MOLECULAR WEIGHT, HIGH DENSITY ETHYLENE/HEXANE COPOLYMER PE 4710 POLYETHYLENE RESIN MEETING THE REQUIREMENTS OF ASTM D 3350 WITH A CELL CLASSIFICATION OF PE445474C FOR MATERIALS IN ACCORDANCE WITH ASTM F 714 OR ASTM D3035, DR11; OR PE334434C FOR MATERIALS IN ACCORDANCE WITH AWWA C906, DR14.. PIPE SIZES 3" AND LARGER SHALL HAVE A MANUFACTURING STANDARD OF ASTM F 714, WHILE PIPE SMALLER THAN 3" SHALL BE MANUFACTURED TO THE DIMENSIONAL REQUIREMENTS LISTED IN ASTM D 3035. PIPE SHALL BE SIZED IN ACCORDANCE WITH DIPS. ALL MATERIAL SHALL HAVE A HYDROSTATIC DESIGN BASIS OF 1600 PSI. THE PIPE SHALL CONTAIN NO RECYCLED COMPOUND EXCEPT THAT GENERATED IN THE MANUFACTURER'S OWN PLANT FROM RESIN OF THE SAME SPECIFICATION FROM THE SAME RAW MATERIAL. ALL MATERIAL SHALL BE LISTED BY THE PLASTIC PIPE INDUSTRY IN THE NAME OF THE PIPE MANUFACTURER AND SHALL BE BASED ON ASTM D 2837 AND PPI TR-3 TESTING AND VALIDATION FOR SAMPLES OF THE PIPE MANUFACTURER'S PRODUCTION PIPE.
B. IN ADDITION TO THE HOLDING, STORAGE, AND COLOR REQUIREMENTS IN THESE SPECIFICATIONS, WHEN MOVING FUSED SECTIONS OF PIPE, CHAINS OR CABLE TYPE CHOKERS SHALL BE AVOIDED, NYLON SLINGS ARE PREFERRED. CARE MUST BE EXERCISED TO AVOID CUTTING OR GOUGING THE PIPE.
C. PIPE POSSESSING THE FOLLOWING DEFECTS MAY BE REJECTED FOR INSTALLATION: VARIATION FROM STRAIGHT CENTERLINE; ELLIPTICAL SHAPE; ILLEGIBLE MARKINGS AS REQUIRED HEREIN; DEEP OR EXCESSIVE GOUGES OR SCRATCHES OF THE PIPE WALL; FRACTURES, PUNCTURES, OR CRACKS PASSING THROUGH THE PIPE WALL; DAMAGED ENDS WHERE SUCH DAMAGE WOULD PREVENT MAKING A SATISFACTORY JOINT.

2. JOINTS
A. HDPE PIPE SHALL BE JOINED INTO CONTINUOUS LENGTHS ON THE JOB SITE ABOVE GROUND. THE JOINING METHOD SHALL BE THE BUTT FUSION METHOD AND SHALL BE PERFORMED IN STRICT ACCORDANCE WITH THE PIPE MANUFACTURER'S RECOMMENDATIONS. ELECTROFUSION SHALL NOT BE USED EXCEPT AS NEEDED TO CONNECT ADJACENT DIRECTIONALLY DRILLED SECTIONS WHICH ARE TO BE CONNECTED IN THE TRENCH BOTTOM. MECHANICAL JOINT ADAPTERS ARE REQUIRED TO MECHANICALLY CONNECT THE HDPE PIPE TO THE MAIN LINE. JOINT RESTRAINT TO PREVENT AXIAL SEPARATION SHALL BE INCORPORATED INTO THE DESIGN OF THE SLEEVE OR COUPLING USED TO CONNECT HDPE PIPE PLAIN ENDS. INTERNAL PIPE WALL STIFFENERS MUST BE USED WHEN RESTRAINING HDPE. THE RESTRAINED COUPLING SYSTEM SHALL BE SERIES 4800 MANUFACTURED BY EBAA IRON, INC. OR AN APPROVED EQUAL.

3. FITTINGS
A. FITTINGS SHALL BE EITHER HDPE OR DUCTILE IRON. HDPE FITTINGS SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM D 3261 BY INJECTION MOLDING, A COMBINATION OF EXTRUSION AND MACHINING, OR FABRICATED FROM HPDE PIPE CONFORMING TO THIS SPECIFICATION. FITTINGS SHALL BE FULLY PRESSURE RATED AND PROVIDE A WORKING PRESSURE EQUAL TO THE ADJACENT PIPE WITH SAFETY FACTOR OF 2. DUCTILE IRON FITTINGS SHALL BE RESTRAINED JOINT DUCTILE IRON FITTINGS CONFORMING TO ANSI A21.10/AWWA C110 AND ANSI A21.11/AWWA C111 WITH MJ ADAPTERS.

4. MARKINGS
A. DURING THE EXTRUSION PRODUCTION, THE HDPE PIPE SHALL BE CONTINUOUSLY MARKED PER ASTM AND AWWA WITH DURABLE PRINTING WITH, AT A MINIMUM, THE FOLLOWING: NOMINAL PIPE SIZE, DIMENSION RATIO, PRESSURE RATING, TRADE NAME, MATERIAL CLASSIFICATION, CERTIFICATION BASES, AND DATE.

5. LOCATING TRACING WIRE
A. ALL HDPE PIPE FOR PRESSURE SANITARY SEWER SHALL BE INSTALLED WITH TRACING WIRE. TRACING WIRE SHALL BE 10 AWG SOLID COPPER HIGH STRENGTH TRACER WIRE, CCS REINFORCED BY COPPERHEAD OR APPROVED EQUAL.
B. LOCATING TRACER WIRE SHALL BE BROUGHT TO SURFACE NO LESS THAN EVERY 500 L.F.
C. LOCATE WIRE SHALL BE TESTED FOR CONTINUITY PRIOR TO ACCEPTANCE.

6. CERTIFICATION
A. THE CONTRACTOR SHALL FURNISH, UPON REQUEST, CERTIFIED REPORTS STATING THAT INSPECTION AND SPECIFIED TESTS HAVE BEEN MADE AND THAT THE RESULTS THEREOF COMPLY WITH THE APPLICABLE STANDARDS.

F. AIR RELEASE VALVES
1. AIR RELEASE VALVES SHALL BE COMBINATION AIR RELEASE VALVES AS MANUFACTURED BY A.R.I. OR OWNER APPROVED EQUAL. THE VALVE SHALL ALLOW AIR TO ESCAPE OUT OF THE LARGE ORIFICE WHEN AIR IS PRESENT AND CLOSE WHEN LIQUID ENTERS THE VALVE. WHEN THE VALVE IS CLOSED AND PRESSURIZED, THE SMALL AIR RELEASE ORIFICE WILL OPEN TO ALLOW SMALL POCKETS OF AIR TO ESCAPE AUTOMATICALLY AND INDEPENDENTLY OF THE LARGE ORIFICE. THE LARGE ORIFICE SHALL ALSO ALLOW AIR TO ENTER TO BREAK VACUUM. THE BODY INLET SHALL BE BAFFLED TO PROTECT THE FLOAT FROM DIRECT FORCES OF RUSHING AIR AND WATER TO PREVENT PREMATURE VALVE SHUT-OFF.
2. MATERIALS SHALL CONFORM TO THE FOLLOWING:
A. BODY AND COVER: DUCTILE IRON (ASTM A536 GR 65-45-12)
B. FLOAT: STAINLESS STEEL (ASTM A240)
C. NEEDLE & SEAT: BUNA-N
D. PLUG: STAINLESS STEEL (ASTM A276)
E. LEVERAGE FRAME: DELRINCAST IRON (ASTM D4184/ASTM A126 GR. B)
3. VALVES SHALL BE COMBINATION AIR RELEASE AND VACUUM VALVE WITH A SINGLE BODY. THE VALVES SHALL BE RATED FOR 150 PSI WORKING PRESSURE, AND CONFORM TO AWWA C512. VALVE SHALL BE PROVIDED WITH THREADED CONNECTIONS, AND BE MOUNTED ON A FULL OPENING STAINLESS STEEL BALL VALVE TO ISOLATE THE AIR RELEASE VALVE FROM THE SYSTEM.

G. PRESSURE TYPE PIPE COUPLINGS:
1. TUBULAR-SLEEVE COUPLINGS:
2. COUPLINGS SHALL MEET AWWA C219, WITH CENTER SLEEVE, GASKETS, END RINGS, AND BOLT FASTENERS.
3. METAL, BOLTED, SLEEVE-TYPE, REDUCING OR TRANSITION COUPLINGS FOR JOINING UNDERGROUND PRESSURE PIPING:
4. COUPLINGS SHALL MEET A 200-PSI MINIMUM PRESSURE RATING AND ENDS OF SAME SIZES OF THE MAIN LINE PIPING.
5. CENTER-SLEEVE MATERIAL:
6. SLEEVE SHALL BE STAINLESS STEEL.
7. GASKET MATERIAL: GASKETS SHALL BE NATURAL OR SYNTHETIC RUBBER RESISTANT TO SEWAGE.
8. METAL COMPONENT FINISH: FINISH SHALL BE A CORROSION-RESISTANT MATERIAL OR COATING.

2.5 CASING AND JACKING PIPE
A. DESCRIPTION
1. ALL CASING AND JACKING PIPE AND HORIZONTAL BORES SHALL BE APPROVED BY HCRSD.

B. STEEL CASING PIPE
1. STEEL CASING PIPE SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM A53 WITH 35,000 PSI MINIMUM YIELD STRENGTH, AND HAVE THE FOLLOWING MINIMUM WALL THICKNESSES:

24" STEEL CASING SHALL HAVE 0.250" MINIMUM WALL THICKNESS
30" STEEL CASING SHALL HAVE 0.375" MINIMUM WALL THICKNESS
36" STEEL CASING SHALL HAVE 0.375" MINIMUM WALL THICKNESS
42" STEEL CASING SHALL HAVE 0.375" MINIMUM WALL THICKNESS

2. ALL ENCASEMENT PIPE JOINTS SHALL BE WELDED.
3. THE CASING PIPE DIAMETER EQUALS THE CARRIER PIPE'S LARGEST OUTSIDE DIAMETER PLUS 4-INCHES MINIMUM.
4. CARRIER PIPE: PER SECTION 2.3 OR 2.4 OF THESE SPECIFICATIONS.

C. CASING SPACERS
1. MANUFACTURED CASING SPACERS OR WOOD BLOCKING SPACERS ARE REQUIRED ON THE BOTTOM AND TOP TO PREVENT PIPE FROM "FLOATING" DURING GROUT FILLING PROCEDURE.
2. CASING SPACERS SHOULD BE AT 6-FOOT MAXIMUM, CENTER-TO-CENTER, PER DETAIL.

2.6 MANHOLES
A. DESCRIPTION
1. STANDARD MANHOLES SHALL BE CONSTRUCTED COMPLETE, READY FOR USE, INCLUDING EXCAVATION, BACKFILL, CONCRETE WORK, CAST IRON FRAMES AND COVERS, AND PERTINENT WORK AS SHOWN ON THE DRAWINGS. ALL MANHOLES SHALL BE MADE WATERTIGHT, AND THE CONTRACTOR SHALL FURNISH ALL MATERIALS AND PERFORM ALL WORK NECESSARY FOR WATERTIGHT CONSTRUCTION.
2. ALL PROPOSED CASTINGS SET IN PAVED AREAS SHALL BE FLUSH WITH THE FINAL PAVEMENT ELEVATIONS. ALL PROPOSED CASTINGS TO BE SET IN NON-PAVED AREAS SHALL STAND APPROXIMATELY THREE (3) INCHES ABOVE FLUSH WITH THE FINAL GROUND.
3. MAXIMUM MANHOLE SPACING SHALL BE FOUR HUNDRED (400) FEET, UNLESS APPROVAL IS GIVEN BY THE DISTRICT.
4. MANHOLE ELEVATIONS MUST BE SET EIGHTEEN (18) INCHES ABOVE THE CURRENT PUBLISHED INDIANA DEPARTMENT OF NATURAL RESOURCES 100-YEAR BASE FLOOD ELEVATION OF NEARBY WATERWAYS (INCLUDING, BUT NOT LIMITED TO, LAKES, PONDS, STREAMS, AND EMERGENCY SPILLWAYS OR STORM WATER ROUTING). IF THIS REQUIREMENT CANNOT BE MET, THEN WATER TIGHT BOLTED AND GASKETED CASTINGS MUST BE INSTALLED.
5. MANHOLES SHALL BE INSTALLED AT A 6-FOOT MINIMUM DEPTH (7-FOOT PREFERRED), AS MEASURED FROM THE TOP OF CASTING TO THE INVERT.
6. MANHOLES EXTERIOR SHALL BE COATED WITH MATERIAL TO ENSURE WATER TIGHTNESS, E.G. BITUMINOUS WATERPROOF COATING.

B. REINFORCED CONCRETE MANHOLES AND ACCESSORIES
1. MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE ASTM C478, STANDARD SPECIFICATIONS FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS. MANHOLES SHALL BE A MINIMUM DIAMETER OF 48 INCHES WITH A MINIMUM ACCESS DIAMETER OF 24 INCHES. THE MINIMUM WALL THICKNESS SHALL BE FIVE (5) INCHES FOR MANHOLES FOUR (4) FEET IN DIAMETER.
2. THE PRECAST TOPS SHALL BE OF THE ECCENTRIC CONE TYPE. PRECAST FLAT COVERS SHALL BE NOT LESS THAN EIGHT (8) INCHES THICK AND REINFORCED WITH TWO LAYERS OF STEEL WITH A MINIMUM AREA OF 0.39 SQUARE INCHES PER LINEAR FOOT IN BOTH DIRECTIONS IN EACH LAYER. PRECAST FLAT BOTTOMS OF MANHOLES SHALL ALSO BE REINFORCED THE SAME AS SPECIFIED HEREIN FOR PRECAST FLAT TOP. HOISTING LUGS OR HOOKS SHALL BE CAST IN PLACE FOR HANDLING AND SETTING OF THE RINGS. NO THROUGH HOLES SHALL BE PERMITTED. OPENINGS OF PROPER SIZES AND SUITABLE DESIGN SHALL BE CAST IN PLACE FOR RECEIVING THE SEWER AND/OR DROP PIPES AND CONNECTIONS. ADJUSTING RISER RINGS SHALL BE PROVIDED, WITH NO MORE THAN 12-INCHES OF RISER RINGS ALLOWED.
3. ALL MANHOLE JOINTS SHALL BE TONGUE AND GROOVE AND THEY SHALL BE SEALED WITH 1-1/4" BUTYL MASTIC JOINT SEALANT MEETING ASTM C-990. CRACKED OR DAMAGED BARREL JOINTS SHALL NOT BE ALLOWED. ALL JOINTS SHALL ALSO HAVE AN EXTERIOR JOINT WRAP SIMILAR TO THE INFI-SHIELD GATOR WRAP AS MANUFACTURED BY SEALING SYSTEMS INC. OR APPROVED EQUAL. THE JOINT WRAP SHALL BE A MINIMUM OF SIX (6") IN WIDTH.
4. MANHOLE STEPS SHALL BE INSTALLED IN ALL SANITARY SEWER MANHOLES. MANHOLE STEPS SHALL BE POLYPROPYLENE. MANHOLE STEPS SHALL BE INSTALLED IN A VERTICAL ROW ON 16-INCH CENTERS.
5. MANHOLE BASES SHALL BE OF CAST-IN-PLACE MONOLITHIC CONCRETE OR PRECAST CONCRETE. WHERE SEWER LINES PASS THROUGH OR ENTER MANHOLES, THE INVERT CHANNELS SHALL BE SMOOTH AND SEMI-CIRCULAR IN CROSS SECTION WITH THE WALL EXTENDING TO FULL DEPTH ELEVATION OF THE PIPE. THE INVERT CHANNELS SHALL BE FORMED DIRECTLY IN THE CONCRETE OF THE MANHOLE BASE. CHANGES OF DIRECTION OF FLOW WITHIN THE MANHOLES SHALL BE MADE WITH A SMOOTH CURVE WITH AS LONG AS A RADIUS AS POSSIBLE. THE WALLS OF THE CHANNELS MAY BE FLARED OUT TO ALLOW TESTING EQUIPMENT TO BE INSERTED AND REMOVED. THE FLOOR OF THE MANHOLE OUTSIDE THE CHANNELS SHALL BE SMOOTH AND SLOPE TOWARD THE CHANNEL NOT LESS THAN ONE (1) INCH PER FOOT.
6. FOR CAST IN PLACE BASES, NO MORTAR OR CONCRETE SHALL BE PLACED IN WATER, AND NO WATER SHALL BE ALLOWED TO FLOW OVER OR AGAINST THE CONCRETE BEFORE IT HAS HAD ADEQUATE TIME TO SET IN ORDER TO PREVENT DAMAGE TO THE STRUCTURE.
7. THE STANDARD MANHOLE IS FORTY-EIGHT (48") IN DIAMETER. LARGER DIAMETER MANHOLES MAY BE REQUIRED IN INSTANCES WITH LARGE PIPE DIAMETERS OR WITH CERTAIN INTERNAL DROPS, IF APPROVED. MANHOLE BARREL SECTIONS SHALL BE IN ONE, TWO, THREE, OR FOUR FOOT SECTIONS. THE CONE SECTION SHALL BE OF THE ECCENTRIC CONE TYPE, TWO OR THREE FEET IN LENGTH.
8. ADJUSTING RINGS: WHERE ONE (1) SOLID RISER OR BARREL SECTION CANNOT BE USED, FINAL ADJUSTMENTS IN ELEVATION OF THE FRAME AND COVER SHALL ONLY BE ACCOMPLISHED BY THE USE OF PRECAST CONCRETE ADJUSTING RINGS CONFORMING TO ASTM C 478. RINGS SHALL BE OF A NOMINAL THICKNESSES OF FOUR (4"), OR SIX (6") INCHES. NOT MORE THAN TWO (2) RINGS AND NOT MORE THAN TWELVE (12) INCHES TOTAL OF ADJUSTING RINGS SHALL BE ALLOWED FOR ADJUSTMENT OF THE MANHOLE FRAME AND COVER TO REQUIRED ELEVATION. GRADE RING JOINTS SHALL HAVE A 1 ¼" THICK PREFORMED BUTYL RUBBER FLEXIBLE SEALANT CONFORMING TO ASTM C990.
9. ALL PRECAST CONCRETE FOR NEW MANHOLES THAT WILL BE RECEIVING A FORCE MAIN OR ARE WITHIN FIVE HUNDRED (500') FEET UPSTREAM OR DOWNSTREAM OF THE RECEIVING MANHOLE SHALL HAVE THE INTERIOR OF THE MANHOLE LINED WITH CEMENTITIOUS LINERS WITH CALCIUM ALUMINATE MORTARS SUCH AS STRONGSEAL, SAUEREISEN, MADEWELL, CONCO SPRAYROQ OR APPROVED EQUAL. APPLY COATING PER MANUFACTURER'S RECOMMENDATION.
10. MINIMUM MANHOLE DIAMETERS
A. THE FOLLOWING ARE MINIMUM MANHOLE DIAMETERS FOR SANITARY SEWERS ENTERING/EXITING A MANHOLE AT THE FOLLOWING RANGE OF ANGLES:

PIPE SIZE	PIPES ENTERING / LEAVING AT 0° - 45° BEND	PIPES ENTERING / LEAVING AT 45° - 90° BEND
8" - 21"	48"	48"
24"	48"	60"
27" - 30"	60"	60"
33" - 36"	60" *	72"

* NOTE 72" IF THE "A"-LOCK CONNECTOR IS USED.

B. THE MINIMUM MANHOLE DIAMETER TO ACCOMMODATE AN INSIDE DROP IS 60".
C. MANHOLE BASE CHANNELS:
1. MANHOLE CHANNELS SHALL BE MAIN LINE PIPE MATERIAL. LAY MAIN PIPE THROUGH MANHOLE AND CUT TOP OF PIPE OUT TO BE THREE-FOURTHS OF PIPE DIAMETER. FOR ALL MANHOLES WITH EQUAL DIAMETER INFLUENT AND EFFLUENT PIPES, A MINIMUM 0.10 FOOT DROP BETWEEN THE INVERTS AND EFFLUENT PIPES SHALL BE MAINTAINED. FOR CHANGES IN DIRECTION 45 TO 90 DEGREES, A MINIMUM 0.20 FOOT DROP SHALL BE MAINTAINED.

D. SEWER PIPE TO MANHOLE CONNECTIONS
1. TO CONNECT A SANITARY SEWER TO A MANHOLE, A RESILIENT PIPE TO MANHOLE CONNECTOR SHALL BE USED MEETING THE REQUIREMENTS OF ASTM C-923. EITHER A FLEXIBLE BOOT KOR-N-SEAL 1 OR 2, CAST-IN-PLACE DURA-SEAL GASKET OR "A-LOK" GASKET OR AN APPROVED EQUAL SHALL BE USED. CONNECTIONS TO AN EXISTING MANHOLE SHALL BE A FLEXIBLE BOOT SEAL.
2. IF THE FLEXIBLE BOOT CONNECTION IS USED, IT SHALL BE PLACED IN THE REINFORCED CONCRETE MANHOLE BASE AND SECURED TO THE PIPE BY A STAINLESS STEEL CLAMP. FLEXIBLE CONNECTORS SHALL CONFORM TO ASTM C 923.
3. ALL CONNECTIONS SHALL PROVIDE FOR A WATERTIGHT SEAL BETWEEN THE PIPE AND MANHOLE. THE CONNECTOR SHALL BE THE SOLE ELEMENT RELIED UPON TO ASSURE A FLEXIBLE WATERTIGHT SEAL OF THE PIPE TO THE MANHOLE.
4. THE INVERT OF THE CONNECTION SHALL BE GROUTED WITH NON-SHRINK GROUT. THE REMAINDER OF THE RESILIENT CONNECTION SHALL BE FREE OF GROUT TO PROMOTE FLEXIBILITY OF THE CONNECTION.
5. THE RUBBER FOR THE CONNECTOR SHALL CONFORM TO ASTM C 923 AND SHALL BE RESISTANT TO OZONE, WEATHER ELEMENTS, CHEMICALS, INCLUDING ACIDS AND ALKALIS, ANIMAL AND VEGETABLE FATS, OILS AND PETROLEUM PRODUCTS.
6. THE STAINLESS STEEL ELEMENTS OF THE CONNECTOR SHALL BE TOTALLY NON-MAGNETIC SERIES 305 STAINLESS STEEL. THE STAINLESS STEEL CLAMP SHALL BE CAPABLE OF SUSTAINING APPLIED TORQUE IN EXCESS OF EIGHTY (80) INCH-POUNDS.
7. NEW CONNECTIONS MADE TO ANY EXISTING STRUCTURE SHALL BE DRILLED IN THE DIRECTION OF FLOW. THE INTERNAL BASE MATERIAL SHALL BE REMOVED AND RE-POURED WITH THE CHANNELS MEETING THE REQUIREMENTS OF THE MANHOLE BASE SECTION. IF THE STRUCTURAL INTEGRITY OF THE CONCRETE BASE SECTION IS COMPROMISED DURING THE REMOVAL OF THE INTERIOR BASE, THE ENTIRE BASE SECTION SHALL BE REPLACED. THE CONNECTOR BOOT SHALL BE APPROPRIATELY SIZED TO FIT THE OPENING AND SHALL BE KOR-N-SEAL® BY NPC, INC., A-LOK PRODUCTS, INC., OR APPROVED EQUAL.

E. DROP MANHOLES
1. WHERE A SANITARY SEWER OR SANITARY LATERAL ENTERS A MANHOLE TWENTY-FOUR (24) INCHES OR MORE ABOVE THE INVERT OF THE OUTGOING SEWER, THE INCOMING SEWER SHALL BE CONNECTED TO THE MANHOLE BY MEANS OF A DROP CONNECTION.
2. OUTSIDE DROP CONNECTIONS MAY BE EITHER PRECAST OR FIELD FABRICATED. DROP CONNECTIONS ON THE INSIDE OF MANHOLES SHALL BE SECURED TO THE INTERIOR WALL OF THE MANHOLE AND PROVIDE ACCESS FOR CLEANING, AND DROP PIPE CONNECTIONS ON THE OUTSIDE OF MANHOLES SHALL BE ENCASED IN CONCRETE.

F. SAMPLE MANHOLE REQUIREMENTS
1. ALL WAREHOUSE AND INDUSTRIAL SITES SHALL INSTALL A SAMPLING MANHOLE PRIOR TO CONNECTION TO HCRSD SEWER.
2. THE SAMPLING MANHOLE SHALL BE A STANDARD 48-INCH PRECAST CONCRETE MANHOLE.
3. THE SAMPLING MANHOLE SHALL HAVE A THREE (3) FOOT STRAIGHT LATERAL RUN ON BOTH SIDES OF THE MANHOLE.

G. CASTINGS
1. STANDARD MANHOLES SHALL HAVE A SELF-SEALING, HEAVY-DUTY FRAME AND COVER, NEENAH R-1772 OR APPROVED EQUAL. MATERIAL SHALL BE IN COMPLIANCE WITH ASTM A-48, CL 35. EACH LID SHALL HAVE "SANITARY SEWER" MOLDED INTO THE EXTERIOR SURFACE IN LETTERS TWO (2) INCHES IN HEIGHT RECESSED, AND FLUSH WITH SURFACE.
2. WHERE WATERTIGHT CASTINGS ARE REQUIRED, THE MANHOLES SHALL HAVE A BOLT DOWN NEENAH 1772 OR 1022ZI CASTING BY EAST JORDAN IRON WORKS, OR APPROVED EQUAL. THE FRAME SHALL BE ANCHORED THROUGH THE RISER RINGS (IF PROVIDED) TO THE CONE SECTION WITH FOUR (4) GALVANIZED RODS.
3. NO OPEN PICK HOLES SHALL BE ALLOWED.

H. FRAME, CHIMNEY AND JOINT SEAL
1. ALL MANHOLES SHALL HAVE AN EXTERNAL CHIMNEY SEAL AND JOINT SEALS.
2. THE SECTION OF THE MANHOLE FROM THE ECCENTRIC CONE TO THE CASTING FRAME SHALL BE WRAPPED ON THE EXTERIOR WITH JOINT WRAP MEETING THE REQUIREMENTS OF THE UNI-BAND SEALING SYSTEM AS MANUFACTURED BY SEALING SYSTEMS, INC. OR APPROVED EQUAL.
3. ALL MANHOLE JOINTS SHALL BE WRAPPED ON THE EXTERIOR WITH JOINT WRAP MEETING THE REQUIREMENTS OF THE INFI-SHIELD GATOR WRAP AS MANUFACTURED BY SEALING SYSTEMS INC. OR APPROVED EQUAL. THE JOINT WRAP SHALL BE A MINIMUM OF SIX (6") IN WIDTH.
4. NO GROUTING OF THE INTERIOR OR EXTERIOR OF THE JOINT WILL BE REQUIRED.

2.7 APPURTENANCES
A. OIL AND GREASE INTERCEPTOR AND GREASE REMOVAL PIT
1. PIT SHALL BE CONSTRUCTED OF REINFORCED PRECAST CONCRETE OR CAST-IN-PLACE CONCRETE OF THE SHAPE AND CONFIGURATION INDICATED ON THE PLANS. PRECAST VAULTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C857 AND BE RATED FOR AASHTO HS20-44 LOADING. THE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI AT 28 DAYS, AND REINFORCEMENT SHALL COMPLY WITH ASTM A615, GRADE 60. ACCESS TO THE PIT SHALL BE THROUGH 24 INCHES DIAMETER MANHOLE FRAME AND COVER OR THROUGH HINGED ALUMINUM ACCESS MANWAYS.
2. BAFFLES SHALL BE CONSTRUCTED OF 1/4 INCH MILD CARBON STEEL WITH 1/4 INCH THERMOPLASTIC COATING.
3. THE PIT SHALL HOLD A VOLUME OF NO LESS THAN 1000 GALLONS.

PART 3 – EXECUTION

3.1 PREPARATION
A. REMOVE LARGE STONES OR OTHER HARD MATERIALS THAT COULD DAMAGE PIPE OR IMPEDE CONSISTENT BACKFILLING OR COMPACTION.
B. PROTECT AND SUPPORT EXISTING SEWER LINES, UTILITIES, AND APPURTENANCES.

3.2 EXCAVATION
A. CLEARING
1. PRIOR TO EXCAVATION, AREAS WITHIN THE PROJECT LIMITS SHALL BE FIRST CLEARED OF OBSTRUCTIONS, DEBRIS, AND EXISTING FACILITIES WITH THE EXCEPTION OF FACILITIES THAT MUST TEMPORARILY OR PERMANENTLY REMAIN. THE CONTRACTOR SHALL REMOVE AND KEEP SEPARATE THE TOPSOIL, AND SHALL CAREFULLY REPLACE IT AFTER THE BACKFILLING IS COMPLETED.

B. PROTECTION OF EXISTING IMPROVEMENTS REQUIRED TO REMAIN IN PLACE
1. BEFORE ANY EXCAVATION IS STARTED, ADEQUATE PROTECTION SHALL BE PROVIDED FOR ALL LAWNS, TREES, SHRUBS, LANDSCAPE WORK, FENCES, SIDEWALKS, HYDRANTS, UTILITY POLES, STREET, ALLEY AND DRIVEWAY PAVING, CURBS, STORM SEWERS, DITCHES, HEADWALLS, CATCH BASINS, SURFACE INLETS AND ALL OTHER IMPROVEMENTS THAT ARE DESIGNATED TO REMAIN IN PLACE. SUCH PROTECTION SHALL BE PROVIDED AS LONG AS NECESSARY TO PREVENT DAMAGE FROM THE CONTRACTOR'S OPERATIONS.
2. THE CONTRACTOR SHALL EXERCISE EVERY PRECAUTION TO PREVENT DAMAGE TO PROPERTY WITHIN AND OUTSIDE THE IMMEDIATE VICINITY OF THE WORK. THE CONTRACTOR SHALL RESTORE THE GROUND SURFACES, REPLACE OR REPAIR DRIVEWAYS, BUILDINGS, FENCES, RETAINING WALLS, CULVERTS, DRAINS, PAVING, SIDEWALKS, ETC., WHICH ARE REMOVED OR DAMAGED DURING CONSTRUCTION AND WHICH ARE DESIGNATED ON THE PLANS TO REMAIN IN PLACE.

C. PAVEMENT REMOVAL
1. ALL PAVEMENT CUTTING AND REMOVAL SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THE REGULATORY AGENCY RESPONSIBLE FOR THE MAINTENANCE OF THE ROADWAY.

D. MAINTENANCE OF ROADWAY ACCESS
1. ALL MAINTENANCE OF TRAFFIC SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE REGULATORY AGENCY OR AUTHORITY IN CHARGE OF MAINTAINING THE SUBJECT ROADWAY.
2. THE CONTRACTOR SHALL NOT CLOSE OR OBSTRUCT ANY PORTION OF A PUBLIC STREET WITHOUT FIRST NOTIFYING IN WRITING THE APPROPRIATE REGULATORY ROADWAY AUTHORITY. THE CONTR

FREE FROM ROCKS (TWO INCHES IN DIAMETER OR GREATER), CONCRETE, ROOTS, STUMPS, LARGE AMOUNTS OF SOD OR ORGANIC MATTER, RUBBISH, FROZEN MATERIALS AND OTHER SIMILAR MATERIALS THAT MAY CAUSE EXCESSIVE SETTLEMENT. TO ALLOW FOR SETTLEMENT, THE SURFACE OF THE TRENCH SHALL GENERALLY BE LEFT IN A SLIGHTLY ROUNDED CONDITION.

B. STRUCTURES EMBEDMENT AND COMPACTION
1. FOR PURPOSES OF THIS SPECIFICATION, STRUCTURES SHALL INCLUDE BUT NOT BE LIMITED TO VAULTS AND MANHOLES, ITEMS SPECIFICALLY EXCLUDED FROM THIS DEFINITION OF "STRUCTURES" ARE PIPE, CONDUITS AND THEIR APPURTENANCES EXCEPT THOSE LISTED HEREIN.
2. STRUCTURE BACKFILLING AND COMPACTION SHALL COMPLY WITH THE REQUIREMENTS AS SPECIFIED FOR THE ADJACENT SANITARY SEWER.
3. ALL EXCAVATIONS SHALL BE BACKFILLED TO THE ORIGINAL SURFACE OF THE GROUND OR SUCH OTHER GRADE AS SHOWN ON THE PLANS. THE BACKFILLING SHALL BE PERFORMED AS SOON AS POSSIBLE AFTER CONCRETE, MORTAR AND PIPE JOINTS HAVE SUFFICIENT STRENGTH TO RESIST THE IMPOSED LOAD WITHOUT DAMAGE. ALL APPURTENANCES AND ATTACHMENTS TO STRUCTURE WALLS SHALL BE MADE AND ANY WALL COATINGS SHALL BE IN PLACE AND CURED PRIOR TO BACKFILLING AT THAT ELEVATION.
4. PRIOR TO BACKFILLING, ALL FORMWORK AND CONSTRUCTION DEBRIS WILL BE REMOVED. ANY FROZEN OR WET SUBSOIL WILL BE THAWED OR DRIED AND COMPACTED OR REMOVED PRIOR TO RECEIVING BACKFILL. DURING COLD SEASONS, GRADES RECEIVING BACKFILL WILL BE PROTECTED FROM FROST DURING THE WORK PROGRESS.
5. RAINFALL AND/OR GROUNDWATER TRAPPED IN THE EXCAVATION DURING BACKFILL OPERATIONS SHALL BE PUMPED OUT BY THE CONTRACTOR. EXCESSIVELY WET SOIL OR SOIL WHICH HAS ERODED INTO THE EXCAVATION SHALL BE REMOVED OR EXCAVATED AND RE-COMPACTED PRIOR TO PLACING ADDITIONAL BACKFILL MATERIAL.
6. OPENINGS IN STRUCTURES TO RECEIVE PIPE SHALL BE TEMPORARILY PLUGGED OR BULKHEADED DURING BACKFILL OPERATIONS. BACKFILL SHALL PROCEED TO AN ELEVATION LEVEL WITH THE INVERT OF THE PIPE. THE PIPE SHALL THEN BE BEDDED AND BACKFILLED IN ACCORDANCE WITH THE APPLICABLE DRAWING DETAILS AND SPECIFICATIONS.

C. TEMPORARY SURFACES SUBJECT TO TRAFFIC
1. THE CONTRACTOR SHALL OPEN STREETS TO TRAFFIC IMMEDIATELY AFTER COMPLETING THE BACKFILL OPERATION. THE CONTRACTOR SHALL ACCOMPLISH THIS BY INSTALLING THE COMPACTED AGGREGATE BASE IMMEDIATELY AFTER GRANULAR BACKFILL. WHEN TEMPORARY ASPHALT PAVEMENT IS REQUIRED THIS SHALL ALSO BE INSTALLED IMMEDIATELY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE OF THE TEMPORARY SURFACE TO PROMOTE SAFETY OF THE TRAVELLING PUBLIC.

D. MAINTAINING TRENCH SURFACES
1. ALL SURFACE SETTLEMENT OF THE BACKFILL ALONG TRENCHES LOCATED BENEATH STREETS, ROADS, ALLEYS, DRIVEWAYS AND PARKING LOTS WHICH ARE SUBJECT TO TRAFFIC SHALL BE KEPT FILLED LEVEL WITH OR SLIGHTLY ABOVE THE ORIGINAL PAVED SURFACE AT ALL TIMES WITH COMPACTED AGGREGATE BASE MATERIAL UNTIL THE PERMANENT PAVEMENT IS SATISFACTORILY RESTORED. WHEN TEMPORARY ASPHALT PAVEMENT IS USED, DEPRESSIONS AND "POT HOLES" SHALL BE PROMPTLY FILLED WITH THE TEMPORARY ASPHALT MATERIAL. ATTENTION SHALL BE GIVEN BY THE CONTRACTOR TO THE TIMELY AND PROPER MAINTENANCE, LEVELING AND GRADING OF THE SURFACE OF ALL BACKFILLED TRENCHES, ESPECIALLY THOSE SUBJECT TO TRAFFIC AND ESPECIALLY FOLLOWING RAINS. THE SURFACE OF STREETS, ROADS AND ALLEYS SHALL BE MAINTAINED SMOOTH AND FREE OF RUTS AND WATER TRAPPING DEPRESSIONS BY PERIODIC BLADING, SCARIFYING; AND/OR FILLING SETTLED AREAS, RUTS, POCKETS, OR HOLES WITH COMPACTED AGGREGATE BASE MATERIAL OR TEMPORARY ASPHALT WHERE USED.
2. IN EXISTING RESIDENTIAL AREAS WHERE STONE AGGREGATE HAS BEEN TEMPORARILY USED TO RESTORE THE ROADWAY SURFACE, DUST PREVENTION MAY BE REQUIRED TO REDUCE THE EFFECT OF DUST UPON LOCAL RESIDENTS.
3. IN AREAS OUTSIDE OF THE INFLUENCE OF TRAFFIC, UNLESS OTHERWISE SPECIFIED, THE BACKFILL SHALL BE NEATLY ROUNDED OVER THE TRENCH TO A SUFFICIENT HEIGHT TO ALLOW FOR SETTLEMENT TO GRADE AFTER CONSOLIDATION. PRIOR TO THE ACCEPTANCE OF THE WORK, ANY SURFACE SETTLEMENT BELOW ORIGINAL GROUND SURFACE SHALL BE REFILLED AND RESTORED.

3.4 GRAVITY SANITARY SEWER PIPE INSTALLATION

A. DESCRIPTION
1. THIS SECTION ON THE LAYING OF SEWERS ADDRESSES NON-RIGID PIPE. POLYVINYL CHLORIDE (PVC), HDPE, EITHER AWWA C900/C905 OR SDR 35, 26 OR 21, PIPE SHALL BE CONSIDERED NON-RIGID OR FLEXIBLE CONDUITS.
2. GRAVITY SEWER MAINS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D 2321 STANDARDS AND MANUFACTURER'S RECOMMENDATIONS. IF ANY CONFLICT BETWEEN THESE STANDARDS AND MANUFACTURER'S RECOMMENDATIONS, THE MANUFACTURER'S RECOMMENDATIONS SHALL TAKE PRECEDENCE.
3. ALL PIPES SHALL BE HANDLED, STORED AND INSTALLED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.
4. THE MINIMUM COVER FOR SANITARY SEWER SHALL BE FIVE (5) FEET. THE MAXIMUM ALLOWABLE DEPTH SHALL BE PER MANUFACTURER'S RECOMMENDATIONS AND SHALL BE BASED UPON THE BEDDING AND BACKFILL USED FOR THE INSTALLATION.
5. SANITARY SEWERS SHALL BE CONSTRUCTED WITH A TEN (10) FOOT MINIMUM SEPARATION FROM AN EXISTING OR PROPOSED WATER MAIN, MEASURED HORIZONTALLY FROM THE OUTSIDE EDGE OF THE SANITARY SEWER TO THE OUTSIDE EDGE OF THE WATER MAIN. A VERTICAL SEPARATION OF A MINIMUM OF EIGHTEEN (18") INCHES, MEASURED VERTICALLY FROM THE OUTSIDE EDGE OF THE SANITARY SEWER TO THE OUTSIDE EDGE OF THE WATER MAIN, MUST ALSO BE MAINTAINED. WHEN A SANITARY SEWER MAIN CROSSES A WATER MAIN, IT SHALL CROSS AT AS NEARLY TO NINETY (90) DEGREES AS POSSIBLE BUT NOT LESS THAN FORTY-FIVE (45) DEGREES, MEASURED FROM THE CENTERLINES OF THE SANITARY SEWER AND WATER MAIN. NO SANITARY MANHOLE SHALL BE LOCATED WITHIN EIGHT (8') FEET OF A WATER MAIN, MEASURED FROM THE OUTSIDE EDGE OF THE SANITARY SEWER MANHOLE TO THE CLOSEST OUTSIDE EDGE OF THE WATER MAIN.
6. WHERE REQUIRED HORIZONTAL AND/OR VERTICAL SEPARATION FROM WATER LINES CAN'T BE MET, THE SEWER MATERIAL SHALL BE CONSTRUCTED OF PVC SDR 21 OR PVC AWWA C900/C905 PIPE FOR A DISTANCE OF TEN (10') FEET ON EITHER SIDE OF THE CROSSING POINT AND SHALL MEET THE REQUIREMENTS OF 327 IAC.

B. ALIGNMENT AND GRADE
1. ALL PIPE SHALL BE CONSTRUCTED BEGINNING FROM THE LOWEST POINT AND SHALL BEGIN AT EITHER A NEW STRUCTURE OR CONNECTION TO AN EXISTING STRUCTURE. CONSTRUCTION SHALL PROCEED TO THE LINES AND GRADES SHOWN ON THE APPROVED DRAWINGS. LINE AND GRADE BETWEEN MANHOLES SHALL BE MAINTAINED BY USE OF LASER.
2. THE HCRSD WILL NOT ACCEPT GRAVITY SEWER DESIGNED OR INSTALLED BELOW MINIMUM SLOPE AS SPECIFIED IN 327 IAC ARTICLE 3.
3. THE MINIMUM SLOPE OF END RUN GRAVITY SEWERS SHALL BE 1.00%. END RUN LENGTH SHALL BE MAXIMIZED TO REDUCE THE NUMBER OF MANHOLES. AN END RUN SEWER IS DEFINED AS FOLLOWS:
   A. THE UPSTREAM MANHOLE HAS NO INFLUENT FLOWS FROM SEWERS, AND
   B. A SEWER IS NOT PLANNED TO BE EXTENDED FROM THE UPSTREAM MANHOLE IN THE FUTURE.
4. THE CONTRACTOR SHALL VERIFY THE INITIAL STARTING ELEVATION FROM AT LEAST TWO (2) ESTABLISHED BENCHMARKS.

C. TRENCHING
1. GENERAL
   A. EXCAVATION AND BACKFILLING SHALL BE PERFORMED ACCORDING TO THE EMBEDMENT AND BACKFILLING SECTION, SECTION 3.3 OF THESE SPECIFICATIONS.

D. PIPE LAYING
1. ALL PIPE, FITTINGS AND VALVES SHALL BE LOWERED CAREFULLY INTO THE TRENCH IN SUCH A MANNER AS TO PREVENT DAMAGE TO MATERIALS AND PROTECTIVE COATINGS AND LININGS. UNDER NO CIRCUMSTANCES SHALL GRAVITY SEWER MAIN MATERIALS BE DROPPED OR DUMPED INTO THE TRENCH. THE TRENCH SHALL BE DEWATERED PRIOR TO INSTALLATION OF THE PIPE.
2. EXAMINATION OF MATERIAL
   A. ALL PIPE, FITTINGS AND VALVES AND OTHER APPURTENANCES SHALL BE EXAMINED CAREFULLY FOR DAMAGE AND OTHER DEFECTS IMMEDIATELY BEFORE INSTALLATION.
3. PIPE ENDS
   A. ALL LUMPS, BLISTERS, AND EXCESS COATING SHALL BE REMOVED FROM THE SOCKET AND PLAIN ENDS OF EACH PIPE, AND THE OUTSIDE OF THE PLAIN END AND THE INSIDE OF THE BELL SHALL BE WIPED CLEAN AND DRY AND BE FREE FROM DIRT, SAND, GRIT OR ANY FOREIGN MATERIALS BEFORE THE PIPE IS LAID.
4. PIPE CLEANLINESS
   A. FOREIGN MATERIAL SHALL BE PREVENTED FROM ENTERING THE PIPE WHILE IT IS BEING PLACED IN THE TRENCH.
5. PIPE PLACEMENT
   A. AS EACH LENGTH OF PIPE IS PLACED IN THE TRENCH, THE JOINT SHALL BE ASSEMBLED AND THE PIPE BROUGHT TO CORRECT LINE AND GRADE. THE PIPE SHALL BE SECURED IN PLACE WITH SPECIFIED BACKFILL MATERIAL.
6. PIPE PLUGS
   A. AT TIMES WHEN PIPE-LAYING IS NOT IN PROGRESS, THE OPEN ENDS OF PIPE SHALL BE CLOSED BY A WATERTIGHT PLUG. THE PLUG SHALL BE FITTED WITH A MEANS FOR VENTING. WHEN PRACTICAL, THE PLUG SHALL REMAIN IN PLACE UNTIL THE TRENCH IS PUMPED COMPLETELY DRY. CARE MUST BE TAKEN TO PREVENT PIPE FLOTATION, SHOULD THE TRENCH FILL WITH WATER.
   B. PRIOR TO REMOVAL OF THE PLUG FOR EXTENDING THE LINE OR FOR ANY OTHER REASON, AIR AND/OR WATER PRESSURE IN THE LINE SHALL BE RELEASED.

E. JOINT ASSEMBLY
1. JOINTS SHALL BE ASSEMBLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
2. ASSEMBLY
   A. AFTER PLACING A LENGTH OF PIPE IN THE TRENCH, THE MANUFACTURER'S LUBRICANT SHALL BE PROPERLY APPLIED. SPIGOT END SHALL THEN BE CENTERED IN THE BELL AND THE PIPE PUSHED HOME AND BROUGHT TO CORRECT LINE AND GRADE. PIPE AND FITTINGS WHICH DO NOT ALLOW A SUFFICIENT AND UNIFORM SPACE FOR JOINTS SHALL BE REMOVED AND REPLACED WITH PIPE OF PROPER DIMENSIONS TO INSURE SUCH UNIFORM SPACE. PRECAUTIONS SHALL BE TAKEN TO PREVENT DIRT FROM ENTERING THE JOINT SPACE.
3. PIPE CUTTING
   A. CUTTING PIPE FOR INSERTION OF VALVES, FITTINGS, OR CLOSURE PIECES SHALL BE DONE IN CONFORMANCE RECOMMENDATIONS OF THE MANUFACTURER OF THE CUTTING EQUIPMENT. CUTTING SHALL BE DONE IN A SAFE, WORKMANLIKE MANNER WITHOUT CREATING DAMAGE TO THE PIPE LINING. AN OXYACETYLENE TORCH SHALL NOT BE USED.
   B. CUT ENDS AND ROUGH EDGES SHALL BE GROUND SMOOTH, AND FOR PUSH-ON JOINT CONNECTIONS THE CUT END SHALL BE BEVELED BY METHODS RECOMMENDED BY THE MANUFACTURER.

3.5 PRESSURE PIPE INSTALLATION

A. DESCRIPTION
1. PRESSURE SEWER MAINS SHALL BE INSTALLED IN ACCORDANCE WITH AWWA/ASTM D-2774 STANDARDS AND MANUFACTURER'S RECOMMENDATIONS. IF ANY CONFLICT BETWEEN THESE STANDARDS AND MANUFACTURER'S RECOMMENDATIONS, THE MANUFACTURER'S RECOMMENDATIONS SHALL TAKE PRECEDENCE.

B. ALIGNMENT AND GRADE
1. THE PRESSURE SEWER MAINS SHALL BE LAID AND MAINTAINED TO LINES AND GRADES ESTABLISHED BY THE DRAWINGS, WITH FITTINGS AND VALVES AT THE REQUIRED LOCATIONS. VALVE OPERATING STEMS SHALL BE ORIENTED IN A MANNER TO ALLOW PROPER OPERATION.
2. CLEARANCE
   A. WHEN CROSSING EXISTING PIPELINES OR OTHER STRUCTURES, ALIGNMENT AND GRADE MAY BE ADJUSTED AS NECESSARY, TO PROVIDE CLEARANCE AS REQUIRED BY FEDERAL, STATE, AND LOCAL REGULATIONS AND TO PREVENT FUTURE DAMAGE OR CONTAMINATION OF EITHER THE PIPELINES OR STRUCTURES.
3. DEPTH
   A. THE MINIMUM COVER FOR SANITARY FORCE MAIN SHALL BE FOUR (4) FEET. THE MAXIMUM ALLOWABLE DEPTH SHALL BE PER MANUFACTURER'S RECOMMENDATIONS AND SHALL BE BASED UPON THE BEDDING AND BACKFILL USED FOR THE INSTALLATION.
4. SLOPE
   A. FORCE MAINS MUST BE DESIGNED AT A CONSTANT POSITIVE SLOPE FROM LOW POINTS AND CLEAN-OUTS TO AIR/VACUUM RELIEF VALVES.

C. TRENCHING
1. GENERAL
   A. EXCAVATION AND BACKFILLING SHALL BE PERFORMED ACCORDING TO THE EMBEDMENT AND BACKFILLING SECTION, SECTION 3.3 OF THESE SPECIFICATIONS.

D. PIPE LAYING
1. ALL PIPE, FITTINGS AND VALVES SHALL BE LOWERED CAREFULLY INTO THE TRENCH IN SUCH A MANNER AS TO PREVENT DAMAGE TO MATERIALS AND PROTECTIVE COATINGS AND LININGS. UNDER NO CIRCUMSTANCES SHALL PRESSURE SEWER MAIN MATERIALS BE DROPPED OR DUMPED INTO THE TRENCH. THE TRENCH SHALL BE DEWATERED PRIOR TO INSTALLATION OF THE PIPE.
2. EXAMINATION OF MATERIAL
   A. ALL PIPE, FITTINGS AND VALVES AND OTHER APPURTENANCES SHALL BE EXAMINED CAREFULLY FOR DAMAGE AND OTHER DEFECTS IMMEDIATELY BEFORE INSTALLATION.
3. PIPE ENDS
   A. ALL LUMPS, BLISTERS, AND EXCESS COATING SHALL BE REMOVED FROM THE SOCKET AND PLAIN ENDS OF EACH PIPE, AND THE OUTSIDE OF THE PLAIN END AND THE INSIDE OF THE BELL SHALL BE WIPED CLEAN AND DRY AND BE FREE FROM DIRT, SAND, GRIT OR ANY FOREIGN MATERIALS BEFORE THE PIPE IS LAID.
4. PIPE CLEANLINESS
   A. FOREIGN MATERIAL SHALL BE PREVENTED FROM ENTERING THE PIPE WHILE IT IS BEING PLACED IN THE TRENCH.
5. PIPE PLACEMENT
   A. AS EACH LENGTH OF PIPE IS PLACED IN THE TRENCH, THE JOINT SHALL BE ASSEMBLED AND THE PIPE BROUGHT TO CORRECT LINE AND GRADE. THE PIPE SHALL BE SECURED IN PLACE WITH SPECIFIED BACKFILL MATERIAL.
6. PIPE PLUGS
   A. AT TIMES WHEN PIPE-LAYING IS NOT IN PROGRESS, THE OPEN ENDS OF PIPE SHALL BE CLOSED BY A WATERTIGHT PLUG. THE PLUG SHALL BE FITTED WITH A MEANS FOR VENTING. WHEN PRACTICAL, THE PLUG SHALL REMAIN IN PLACE UNTIL THE TRENCH IS PUMPED COMPLETELY DRY. CARE MUST BE TAKEN TO PREVENT PIPE FLOTATION, SHOULD THE TRENCH FILL WITH WATER.
   B. PRIOR TO REMOVAL OF THE PLUG FOR EXTENDING THE LINE OR FOR ANY OTHER REASON, AIR AND/OR WATER PRESSURE IN THE LINE SHALL BE RELEASED.

E. JOINT ASSEMBLY
1. JOINTS SHALL BE ASSEMBLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
2. ASSEMBLY
   A. AFTER PLACING A LENGTH OF PIPE IN THE TRENCH, THE MANUFACTURER'S LUBRICANT SHALL BE PROPERLY APPLIED. SPIGOT END SHALL THEN BE CENTERED IN THE BELL AND THE PIPE PUSHED HOME AND BROUGHT TO CORRECT LINE AND GRADE. PIPE AND FITTINGS WHICH DO NOT ALLOW A SUFFICIENT AND UNIFORM SPACE FOR JOINTS SHALL BE REMOVED AND REPLACED WITH PIPE OF PROPER DIMENSIONS TO INSURE SUCH UNIFORM SPACE. PRECAUTIONS SHALL BE TAKEN TO PREVENT DIRT FROM ENTERING THE JOINT SPACE.
3. PIPE CUTTING
   A. CUTTING PIPE FOR INSERTION OF VALVES, FITTINGS, OR CLOSURE PIECES SHALL BE DONE IN CONFORMANCE RECOMMENDATIONS OF THE MANUFACTURER OF THE CUTTING EQUIPMENT. CUTTING SHALL BE DONE IN A SAFE, WORKMANLIKE MANNER WITHOUT CREATING DAMAGE TO THE PIPE LINING. AN OXYACETYLENE TORCH SHALL NOT BE USED.
   B. CUT ENDS AND ROUGH EDGES SHALL BE GROUND SMOOTH, AND FOR PUSH-ON JOINT CONNECTIONS THE CUT END SHALL BE BEVELED BY METHODS RECOMMENDED BY THE MANUFACTURER.

F. INSTALLATION BY HORIZONTAL DIRECTIONAL DRILLING (HDD)
1. EQUIPMENT
   A. THE DIRECTIONAL DRILLING SYSTEM SHALL BE REMOTELY STEERABLE AND PERMIT ELECTRONIC MONITORING OF TUNNEL DEPTH AND LOCATION. THE SYSTEM SHALL BE ABLE TO CONTROL THE DEPTH AND DIRECTION OF THE PIPE AND MUST BE ACCURATE TO +/- 2 INCHES.
   B. THE SYSTEM SHALL UTILIZE A FLUID-CUTTING PROCESS, USING A LIQUID CLAY SUCH AS BENTONITE. THIS CLAY SHALL BE TOTALLY INERT AND CONTAIN NO RISK TO THE ENVIRONMENT.
   C. THE LIQUID CLAY SHALL REMAIN IN THE BORE HOLE TO INCREASE THE STABILITY OF THE BORE HOLE AND TO PROVIDE A LUBRICANT TO REDUCE FRICTIONAL DRAG WHEN THE PIPE IS INSTALLED.
   D. THE SPOILS SHALL BE RECOVERED BY USE OF A VACUUM SYSTEM MOUNTED ON A VEHICLE FOR REMOVAL OF THE SPOILS. SPOILS SHALL NOT BE DISCHARGED INTO SEWERS OR STORM DRAINS. THE CONTRACTOR IS RESPONSIBLE FOR DISPOSAL OF ALL SPOIL MATERIAL.
2. DRILLING PROCEDURE
   A. CONTRACTOR SHALL CALIBRATE THE DIRECTIONAL DRILLING HEAD LOCATOR AT THE START OF THE DAY AND AT EACH NEW DIRECTIONAL DRILLING OPERATION.
   B. THE MAXIMUM DRILL ANGLE SHALL BE FIFTEEN DEGREES MEASURE PERPENDICULAR TO GRADE TO THE DESIGN DEPTH ELEVATION.
   C. A PILOT HOLE SHALL BE DRILLED ON THE DRILL PATH WITH NO DEVIATIONS GREATER THAN 5% OF DEPTH OVER A LENGTH OF 100 FEET.
   D. UPON SUCCESSFUL COMPLETION OF THE PILOT HOLE, CONTRACTOR WILL REAM THE DRILL HOLE TO A MINIMUM OF 25% GREATER THAN THE OUTSIDE DIAMETER OF THE INSTALLED PIPE USING THE APPROPRIATE TOOLS.
   E. THREE STRANDS OF TRACER WIRE SHALL BE PULLED BACK WITH THE PIPE. THE WIRES SHALL BE INSTALLED ALONG THE PIPE, FASTENED SECURELY TO THE PIPE AT FIVE (5) FOOT INTERVALS, AND TERMINATING ABOVE GROUND WITH THE LEAD TAPED AROUND EACH STRUCTURE.
   F. TEST/PRESSURE RELIEF HOLES (POTHOLES) DUG EVERY 25 FEET SHALL BE REQUIRED ALONG THE BORE ROUTE TO CONFIRM ALIGNMENT AND GRADE, AND TO RELIEVE SUBSURFACE PRESSURE.
   G. AFTER THE PIPE HAS BEEN INSTALLED, ALLOW PIPE MANUFACTURER'S RECOMMENDED AMOUNT OF TIME, BUT NOT LESS THAN FOUR (4) HOURS, FOR COOLING AND RELAXATION DUE TO TENSILE STRESSING PRIOR TO HYDROSTATIC TESTING.

G. THRUST RESTRAINT
1. FITTINGS
   A. ALL PLUGS, CAPS, TEES, REDUCERS AND BENDS, UNLESS OTHERWISE SPECIFIED, SHALL BE PROVIDED WITH SUITABLY RESTRAINED JOINTS, AS SHOWN ON PLANS. VALVES ARE CONSIDERED DEAD ENDS AND SHALL BE RESTRAINED AS SUCH.
2. DESIGN
   A. THE DESIGN PRESSURE IS THE MAXIMUM PRESSURE TO WHICH THE PIPELINE WILL BE SUBJECTED, WITH CONSIDERATION GIVEN TO THE VULNERABILITY OF THE PIPE SOIL SYSTEM WHEN THE PRESSURE IS EXPECTED TO BE APPLIED. IN MOST CASES, THIS WILL BE THE TEST PRESSURE OF THE PIPE, APPLIED SHORTLY AFTER INSTALLATION, WHEN THE PIPE-SOIL SYSTEM IS NORMALLY MOST VULNERABLE.
   B. FOR BURIED PIPELINES, THRUST RESTRAINT IS ACHIEVED BY TRANSFERRING THE THRUST FORCE TO THE SOIL STRUCTURE OUTSIDE THE PIPE. THE OBJECTIVE OF THE DESIGN IS TO DISTRIBUTE THE THRUST FORCES TO THE SOIL STRUCTURE IN SUCH A MANNER THAT JOINT SEPARATION WILL NOT OCCUR IN UNRESTRAINED JOINTS.
3. RESTRAINING MECHANISMS FOR PUSH-ON OR MECHANICAL JOINTS: TIE RODS, CLAMPS, OR OTHER COMPONENTS OF DISSIMILAR METAL SHALL BE PROTECTED AGAINST CORROSION BY HAND APPLICATION OF A SUITABLE COATING OR BY ENCASEMENT OF THE ENTIRE ASSEMBLY WITH 8-MIL LOOSE POLYETHYLENE FILM IN ACCORDANCE WITH ANSI/AWWA C105/A21.5.
   A. GLANDS SHALL BE MANUFACTURED OF DUCTILE IRON CONFORMING TO ASTM A536- 80, GRADE 60-42-10. SET SCREWS SHALL BE HARDENED DUCTILE IRON. THESE DEVICES SHALL HAVE PRESSURE RATING WITH A SAFETY FACTOR OF 281. GLANDS SHALL BE LISTED WITH UL AND FACTORY MANUAL.

H. AIR RELIEF
1. AIR RELIEF VALVES SHALL BE INSTALLED AT EVERY INTERMEDIATE APEX POINT WHERE AIR MAY ACCUMULATE IN THE FORCE MAIN.
2. EACH AIR RELIEF VALVE THAT EXHAUSTS ABOVE GROUND MUST BE EQUIPPED WITH AN EXHAUST PIPE EXTENDING TO A DOWNWARD FACING ELBOW COVERED WITH A CORROSION-RESISTANT, TWENTY-FOUR (24) MESH SCREENED OPENING AT AN ELEVATION OF EIGHTEEN (18') INCHES ABOVE GROUND.
3. AUTOMATIC AIR RELIEF VALVES SHALL NOT BE USED IN AREAS WITHIN THE ONE HUNDRED (100) YEAR FLOOD ELEVATION OR IN AREAS WHERE FLOODING MAY OCCUR UNLESS THEY ARE EQUIPPED WITH A DOWNWARD FACING EXHAUST PIPE COVERED WITH A CORROSION-RESISTANT, TWENTY-FOUR (24) MESH SCREENED OPENING AT AN ELEVATION OF EIGHTEEN (18) INCHES ABOVE THE GROUND SURFACE AND ABOVE THE ONE HUNDRED (100) YEAR FLOOD ELEVATION.
4. MANUALLY OPERATED AIR RELIEF VALVES SHALL BE USED IN AREAS WITHIN THE ONE HUNDRED (100) YEAR FLOOD PLAIN AND WHERE FLOODING MAY OCCUR.

3.6 HORIZONTAL BORING INSTALLATION

A. PITS OR APPROACH TRENCHES
1. EXCAVATE APPROACH TRENCHES OR PITS AS SITE CONDITIONS REQUIRE.
2. ENSURE CASING ENTRANCE FACES AS NEAR PERPENDICULAR TO ALIGNMENT AS CONDITIONS PERMIT.
3. ESTABLISH VERTICAL ENTRANCE FACE AT LEAST 1 FOOT ABOVE TOP OF CASING.
4. INSTALL DEWATERING MEASURES AND EXCAVATION SUPPORTS.

B. CASING PIPE
1. BORING:
   A. PUSH PIPE INTO GROUND WITH BORING AUGER, ROTATING WITHIN PIPE TO REMOVE SOIL.
   B. DO NOT ADVANCE CUTTING HEAD AHEAD OF CASING PIPE, EXCEPT FOR DISTANCE NECESSARY TO PERMIT CUTTING TEETH TO CUT CLEARANCE FOR PIPE.
   C. ARRANGE MACHINE BORE AND CUTTING HEAD TO BE REMOVABLE FROM WITHIN PIPE.
   D. ARRANGE FACE OF CUTTING HEAD TO PROVIDE BARRIER TO FREE FLOW OF SOFT MATERIAL.
   E. IF UNSTABLE SOIL IS ENCOUNTERED DURING BORING, RETRACT CUTTING HEAD INTO CASING TO PERMIT BALANCE BETWEEN PUSHING PRESSURE AND RATIO OF PIPE ADVANCEMENT TO QUANTITY OF SOIL.
   F. GROUT TO FILL VOIDS IF VOIDS DEVELOP GREATER THAN OUTSIDE DIAMETER OF PIPE BY APPROXIMATELY 1 INCH.
   G. IF BORING IS OBSTRUCTED, RELOCATE, JACK, OR TUNNEL AS DIRECTED BY HCRSD REPRESENTATIVE.
2. JACKING:
   A. CONSTRUCT ADEQUATE THRUST WALL NORMAL TO PROPOSED LINE OF THRUST.
   B. IMPART THRUST LOAD TO PIPE THROUGH SUITABLE THRUST RING SUFFICIENTLY RIGID TO ENSURE UNIFORM DISTRIBUTION OF THRUST LOAD ON FULL PIPE CIRCUMFERENCE.
3. CARRIER PIPE:
   A. CLEAN AND INSPECT PIPE.
   B. PLACE CARRIER PIPE PER DETAIL. EXERCISE CARE TO PREVENT DAMAGE TO PIPE JOINTS WHEN CARRIER PIPE IS PLACED IN CASING.
   C. SUPPORT PIPELINE WITHIN CASING SO NO EXTERNAL LOADS ARE TRANSMITTED TO CARRIER PIPE.
   D. ATTACH SUPPORTS TO BARREL OF CARRIER PIPE; DO NOT REST CARRIER PIPE ON BELLS.
   E. THE ANNULAR SPACE BETWEEN THE CASING PIPE AND THE CARRIER PIPE SHALL BE GROUT FILLED.

3.7 MANHOLES

A. INSTALLATION
1. ALL MANHOLES SHALL BE INSTALLED SO THAT THE TOP OF THE MANHOLE CASTING AND FRAME:
   A. IN AREAS NOT SUBJECT TO TRAFFIC, THE LID SHALL BE SET AT THREE (3") INCHES ABOVE THE SURROUNDING SURFACE AFTER EARTH SETTLEMENT.
   B. IN AREAS SUBJECT TO TRAFFIC, THE LID SHALL BE FLUSH WITH THE FINAL GROUND ELEVATION.
2. ALL STRUCTURES SHALL BE BEDDED ON A MINIMUM OF TWELVE (12") INCHES OF COMPACTED AGGREGATE MEETING THE GRADATION OF #8 CRUSHED STONE PER INDOT STANDARD SPECIFICATIONS. NO STRUCTURE SHALL BE SET ON SOFT OR YIELDING SOILS. IF YIELDING SOILS ARE ENCOUNTERED, THE AREA SHALL BE EXCAVATED AND FILLED WITH COMPACTED CRUSHED STONE.
3. ALL LIFT HOLES IN PRECAST SECTIONS SHALL BE WETTED AND COMPLETELY FILLED WITH NON-SHRINK GROUT, SMOOTHED AND COATED WITH BITUMINOUS WATERPROOFING MATERIAL TO ENSURE WATER TIGHTNESS.
4. INSTALL EXTERIOR CHIMNEY AND JOINT WRAPS PER MANUFACTURER'S INSTRUCTIONS.

B. REGRADING
1. RAISE OR LOWER EXISTING MANHOLES AND STRUCTURES FRAMES AND COVERS, CLEANOUT FRAMES AND COVERS AND VALVE BOXES IN REGRADED AREAS TO FINISH GRADE. CAREFULLY REMOVE, CLEAN AND SALVAGE CAST IRON FRAMES AND COVERS. ADJUST THE ELEVATION OF THE TOP OF THE MANHOLE OR STRUCTURE AS DETAILED ON THE DRAWINGS. ADJUST THE ELEVATION OF THE CLEANOUT PIPE RISER, AND REINSTALL THE CAP OR PLUG. RESET CAST IRON FRAME AND COVER, GROUTING BELOW AND AROUND THE FRAME. INSTALL CHIMNEY SEAL AROUND RESET FRAME AND COVER AS SPECIFIED FOR NEW CONSTRUCTION.
2. DURING PERIODS WHEN WORK IS PROGRESSING ON ADJUSTING MANHOLES OR STRUCTURES COVER ELEVATIONS, THE CONTRACTOR SHALL INSTALL A TEMPORARY COVER ABOVE THE BENCH OF THE STRUCTURE OR MANHOLE. THE TEMPORARY COVER SHALL BE INSTALLED ABOVE THE HIGH FLOW ELEVATION WITHIN THE STRUCTURE, AND SHALL PREVENT DEBRIS FROM ENTERING THE WASTEWATER STREAM.

3.8 APPURTENANCES

A. OIL AND GREASE INTERCEPTOR AND GREASE REMOVAL PIT INSTALLATION
1. PIPE AND FITTINGS SHALL BE PVC, PIPING SHALL BE USED INSIDE OF TRAP, BETWEEN TRAP AND BUILDINGS, AND BETWEEN TRAP AND MANHOLE.
2. MANWAYS AND ACCESS MANHOLES SHALL BE SET TO FINISH GRADE PROVIDING ADEQUATE ACCESS TO THE UNIT. SLOPE PAVEMENT AROUND THE ACCESS-WAY TO PREVENT STORMWATER FROM ENTERING THE UNIT.

B. CLEANOUT INSTALLATION
1. INSTALL CLEANOUTS AND RISER EXTENSIONS FROM SEWER PIPES TO CLEANOUTS AT GRADE. INSTALL CLEANOUT SHUT-OFF VALVE (SEWUR VALVE BY KODIAK CONTROLS, INC. OR APPROVED EQUAL). CLEANOUTS SHALL MATCH DETAIL. INSTALL PIPING SO CLEANOUTS OPEN IN DIRECTION OF FLOW IN SEWER PIPE.
2. SET CLEANOUT FRAMES AND COVERS IN EARTH IN CAST-IN-PLACE-CONCRETE, 18 BY 12 INCHES 1 INCH ABOVE SURROUNDING GRADE.
3. SET CLEANOUT FRAMES AND COVERS IN CONCRETE PAVEMENT AND ROADS WITH TOPS FLUSH WITH PAVEMENT SURFACE.
4. THE TOP OF THE CLEANOUT ASSEMBLY SHALL BE 2 INCHES BELOW THE BOTTOM OF THE COVER TO PREVENT LOADS BEING TRANSFERRED FROM THE FRAME AND COVER TO THE PIPING.

C. BUILDING SERVICE LINES
1. INSTALL SANITARY SEWER SERVICE LINES TO POINT OF CONNECTION WITHIN 3 FEET OUTSIDE OF BUILDING(S) WHERE SERVICE IS REQUIRED AND MAKE CONNECTIONS.

D. SAMPLING MANHOLE
1. INSTALL SAMPLING MANHOLE PRIOR TO CONNECTION TO HCRSD SEWER IN A LOCATION ACCESSIBLE TO HCRSD AND AQUA INDIANA PERSONNEL.
2. THE SAMPLING MANHOLE SHALL HAVE A THREE (3) FOOT STRAIGHT LATERAL RUN ON BOTH SIDES OF THE MANHOLE.

PART 4 – TESTING

4.1 FIELD QUALITY CONTROL

A. ALL SYSTEMS SHALL BE INSPECTED AND TESTED. A HCRSD REPRESENTATIVE MUST BE PRESENT FOR ALL TESTING. AQUA INDIANA SHALL BE CONTACTED 48 HOURS PRIOR TO ANY TESTING. PRIOR TO FINAL ACCEPTANCE, PROVIDE A VIDEO RECORD OF ALL PIPING FOR SANITARY SEWER MAIN EXTENSIONS TO SHOW THE LINES ARE FREE FROM OBSTRUCTIONS, PROPERLY SLOPED AND JOINED.

B. GRAVITY SANITARY SEWERS
1. ONCE CONSTRUCTED, ALL SANITARY SEWERS AND MANHO

PART 1 - GENERAL

1.1 Scope of Work

A. The purpose of these specifications is to provide the main framework for the construction of sanitary sewage lift stations for Hendricks County Regional Sewer District (HCRSD-Owner), and to outline the requirements for the design and construction of sanitary sewage lift stations by a person or entity (Applicant) seeking to construct a lift station for inclusion in, or connection to, the HCRSD sanitary sewer system. The content of this document is therefore by necessity of a general nature which applies to all projects.

1. The term "Owner", where used in these specifications, refers to HCRSD or the authorized representative of HCRSD.
2. The term "Applicant", where used in these specifications, refers to a person or entity seeking permission to connect, construct, alter or disturb, or cause to be connected, constructed, altered or disturbed, any sanitary sewage lift station directly or indirectly tributary to the Owner's sewer system.
3. The term "Contractor", where used in these specifications, refers to a person or entity engaged by HCRSD or Applicant to construct a sanitary sewage lift station.

1.2 Work and Materials to be Provided by the Contractor

A. Unless otherwise indicated, all work, equipment and materials described in these specifications shall be provided by the Contractor.
B. The Contractor shall warrant work and materials for a period of one year from the date of putting the facilities in service. Contractor shall be responsible for full cost of repairs made under warranty.
C. The Contractor shall provide all materials and equipment necessary to clean and test the lift station prior to placing it into service.
D. The Owner is exempt from sales tax for the materials used for lift station construction. However, if lift station is constructed by and for Applicant, Applicant and Contractor shall pay all required sales tax.
E. When tie-ins to the existing system are made, the Contractor shall advise the Owner at least one week in advance of when the connection will be needed. The Contractor shall assert no claims due to delays adeligably caused by the Owner.
F. The Contractor shall obtain and pay for all temporary office facilities, utilities, and material or equipment storage areas which the Contractor desires and that are not shown on the drawings as "to be provided by the Owner".

1.3 Reference Standards and Specifications

A. These Specifications make reference and incorporate other standard specifications. The referenced specifications include the latest version of:
1. Indiana Administrative Code, Section 327-3
2. "National Electrical Safety Code" (NESC)
3. "American National Standards Institute Standards" (ANSI)
4. "Institute of Electrical and Electronic Engineers Standards" (IEEE)
5. "Insulated Power Cable Engineers Association Standards" (IPCEA)
6. "National Bureau of Standards" (NEB)
7. "National Electrical Manufacturers Association Standards" (NEMA)
8. "National Electrical Contractors Association Standard of Installation" (NECA)
9. "National Fire Protection Association Standards" (NFPA)
10. "Underwriters Laboratories Publications" (U.L.)

B. All Contractors are advised to obtain a copy of each specification for their review during bidding and construction.
C. In case of a conflict between these specifications and the reference specifications, HCRSD specifications shall rule. Contractor shall notify Owner of discrepancies between specifications.
D. When reference is made to a reference specification, that specification shall be followed as if it were an integral part of the HCRSD specifications.

1.4 Safety

A. The Contractor is responsible for the protection of persons from injury and prevention of property damage at the project site.
1. All OSHA regulations regarding proper working practices shall be used.
2. All INDOT safety requirements on the marking and performance of construction in roadways shall apply whether the construction is along INDOT roadways or not.
3. The Contractor shall take whatever steps necessary to protect the public from open trenches, material piles, and all other site obstructions.
4. Contractor shall adhere to all requirements listed in 29 CFR 1910 – Occupational Safety and Health Standards.
5. The electrical contractor or control panel manufacturer shall perform an arc flash study for the project if requested by Owner.

1.5 Coordination of Work

A. The Contractor shall coordinate all subcontractors, affected utilities, and governmental agencies that have an involvement in the construction of the project.
1. Roadways shall remain open to the degree satisfactory with the affected governmental agency.
2. Utility service shall remain in near continuous operation to the satisfaction of the utility. During bidding, and prior to construction, the Contractor shall determine if nighttime or other off-time work will be necessary to maintain the desired level of service.
3. All subcontractors shall coordinate their work and arrangements directly through the Contractor.

1.6 Scope of Work

A. Furnish and install sanitary sewage lift station as shown on the plans, including submersible pumping equipment with power and sensor cable, wet well with wet well level device with cable and wet well standby float control switches with cables, valve vault with magnetic flow meter/flow tube (if requested), secondary electrical service conductors and conduits, electrical service meter and sump pump, main fused disconnect, Peterson box/generator connection capable of accepting portable generator wires, lift station controls and enclosure with Omni-site equipment or SCADA monitoring and electronic flow recorder (only if requested by Owner), power and control junction boxes located prior to the control panel, conduit cable seals, explosion proof conduit seal-off fittings, concrete equipment pads, electrical service grounding triangle, all conduits, conductors and electrical connections, equipment structural supports, and appurtenances as a fully operable system compatible with the current HCRSD specifications, as indicated on the approved plans.

1.7 Additional Requirements

A. Lift station shall be located within a fenced area with manually operated gates having a total minimum opening width of 16-ft. The gates shall be capable of being padlocked. The fence shall be 7 ft tall (minimum height) chain link fence. The fence shall be heavy gauge PVC coated, and the poles shall be heavy gauge PVC coated. The fence shall also have vinyl slats that are green or black matching fence and post. The completed fence assembly shall be grounded in accordance with the National Electrical Safety Code.
B. A single exterior site light shall be mounted 12 ft above ground on an aluminum pole set in a concrete base. Floodlight shall be a heavy-duty aluminum fixture with manual activation switch, impact resistant glass and a 500 watt LED lamp. Light shall be equipped with a manually operated toggle switch. Lamp shall be installed in a metal cage to protect it from impact. Exterior site light shall be Lithonia DSXF1 LED P1 40K WFL MVOLT THK DDBXD, or Owner approved equal.
C. Each lift station shall be accessed by a paved driveway and be provided with a paved parking area. Driveway shall be heavy duty rated bituminous or concrete surface, minimum 16-foot wide providing access directly adjacent to the wet well, valve vault, and meter vault. Provide enough turnaround and parking area for one vehicle if requested.
D. Contractor shall provide a permanent bypass pump if requested by Owner.
E. Minimum pump suction and discharge diameter shall be 4-in.
F. No grinder pumps are allowed unless otherwise approved by the Owner.
G. Minimum force main diameter shall be 4-in.
H. Contractor shall provide a magnetic flow meter with data logging with electronic flow recorder if requested by Owner.
I. Each lift station shall have, as a minimum, two pumps. Station shall be designed to provide the design peak hour flow with the largest pump out of service (firm capacity).
J. Electrical requirements:
1. The service entrances and all equipment shall be properly grounded in accordance with Article 250 of the National Electrical Code utilizing a ground triangle.
2. The Contractor shall install the electrical meter (provided by the power company) on a pedestal base approved by the electrical utility company.
3. Electrical service to the lift station shall be three phase configuration. If only single phase power is available, Contractor shall utilize a VFD for each pump to make three phase configuration from single phase power. In this case, the VFD will not be used for pump speed variation.
4. Electrical service voltages may be:
a. 120/240 vac, single phase, three wire
b. 240 vac, three phase, three wire
c. 240/120 vac, three phase, four wire
d. 208Y/120 vac, three phase, four wire
e. 480 vac, three phase, three wire (preferred)
f. 408Y/277 vac, three phase, four wire
4. All conductors shall be routed in conduit. In applications where there is anticipated population growth and the potential for increases in pump horsepower, one spare power and control conduit shall be provided from the wet well to the pumps power and wet well control junction boxes, and from the electrical service source (transformer) to the main fused disconnect.
5. The junction boxes shall have epoxy conduit seals between the junction box and control panel.
6. The conduits between the wet well and the junction box for the pumps shall be a minimum of 4-inch.
7. The lift station controls enclosure shall be mounted a minimum of eighteen inches above the wet well vent outlet and five feet horizontally from all openings.
8. The lift station pumps power, wet well level device, and float switches control junction boxes shall be mounted a minimum of eighteen inches above the wet well vent outlet.
9. The lift station main fused disconnect switch enclosure shall be mounted a minimum of eighteen inches above the wet well vent outlet.

K. Applicant shall provide the following:
1. Buoyancy calculations demonstrating that the wet well and valve vault will remain submerged given saturated soil conditions and using a safety factor of 1.5.
2. Pump sizing calculations, including design average and peak flow rates, total dynamic head, pump cycle times, and wet well detention time. Calculations shall indicate the service area tributary to the lift station, including the number and nature of existing, planned and future units to be served by the lift station.
3. Pump selection documentation to include pump efficiency, impeller diameter, design peak flow rate (in gallons per minute), horsepower, and design rpm's. Provide pump and system curves.
4. For developments that are planned to be constructed in phases, the calculations and documentation shall address the ultimate demands on the station as well as the demands for each phase of the development.
5. Design drawings and structural calculations for concrete slabs used to support the standby generator and other exterior equipment.
6. Electrical sizing calculations to include electrical service size load calculations, and standby generator sizing calculations

L. After plan approval, and prior to construction, applicant shall provide shop drawings to Aqua Indiana and Owner's Engineer for the following:
1. Wet well top slab, bottom slab and risers, including reinforcing steel.
2. Valve and Meter Vaults.
3. Selected lift station equipment including pumps, pumps power and sensor cables, wet well level device and cable, wet well standby float control switches and cables, float switches suspension method, valve vault sump pump, magnetic flow meter / flow tube, electrical service meter pedestal, main fused disconnect, manual transfer switch, lift station controls enclosure and components to include SCADA equipment and electronic flow recorder, pumps power and wet well controls junction boxes, conduit cable seals, explosion proof conduit seal-off fittings, electric service grounding triangle, ground rods, wire and cable, EMT and PVC conduits, waterproof electrical connections, equipment structural supports, site lighting to include fixture, pole, lamp, and pole foundation and grounding details, site fencing and fence grounding details.
4. Lift station controls electrical power and control diagrams indicating all control components, component sizes, ratings, and functions.

M. Operation and Maintenance Manuals: Contractor shall submit two (2) Operation and Maintenance Manuals to Owner. Manuals shall include, at a minimum, the following:
1. Warranty Statement;
2. Pump down test procedures and results from the start-up tests;
3. Operation Instructions;
4. Maintenance Instructions;
5. Recommended spare parts list;
6. Lubrication schedules;
7. Structural diagrams;
8. As-built wiring diagrams;
9. Piping and Instrumentation Drawings (P&ID); and
10. Bill of materials.

N. FACTORY TESTS
1. Each pump to be delivered under this Section shall be tested for performance at the pump manufacturer's factory to determine head versus capacity, efficiencies, and kilowatt draw required for the operating points that are specified. All tests shall be run in accordance with the latest edition of the American Hydraulic Institute Standards and Submersible Wastewater Pump Association and at the appropriate voltage and frequency. Testing shall also include, but not be limited to, the following:
2. Head vs. flow with five (5) equally spaced points including shutoff and maximum flow shall be certified.
3. The input KW, speed, power factor, no load current, and torque characteristics shall be certified.
4. Impeller, motor rating, and electrical connections shall first be checked for compliance to the specifications.
5. Insulation Test: A motor and cable insulation test for moisture content or insulation defects shall be made.
6. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
7. Operational Test: The pump shall be run for 30 minutes submerged, under a minimum of six feet of water.
8. After the operational test has been conducted, the insulation test shall be performed again.
9. After testing, the pump shall be inspected to ensure that the pump maintains full watertight integrity.
10. A written report stating the tests have successfully been completed and providing the results of the test shall be provided for each pump. The pump manufacturer shall also certify that similar tests have been conducted on pumps of a similar size for a period of not less than five (5) years.

PART 2 - PRODUCTS

2.1 Manufacturing Requirements

A. For most products, Owner has limited the number of manufacturers approved for use in its systems. Contractor shall provide the listed manufacturer(s) unless written approval is given by Owner prior to bidding. "Owner approved equal" means that for a specific project, Owner has given written approval that a different manufacturer or model may be used.
B. Electrical system and components in the raw sewage wet well must comply with NEC requirements for Class I, Group D, Division 1 locations.

2.2 Sizes of Material and Additional Material Requirements

A. Where specific sizes of materials are not listed in paragraphs below, sizes will be shown on the Drawings.
B. Contractor shall verify all field dimensions.
C. Refer to HCRSD Standard Details for additional dimension and material requirements.

2.3 Sewage Pumps

A. Furnish and install submersible non-clog sewage pumps capable of passing a 3 in. diameter spherical solid. Pump suction and discharge openings shall be 4 in. or greater in diameter. Pumps shall be Myers, Hydromatic, Flygt, Grundfos, or Owner approved equal.
B. Pump Construction:
1. Submersible pumps and motors shall be designed specifically for raw sewage use, including totally submerged operation during a portion of each pumping cycle and shall meet the requirements of the National Electrical Code (NEC) for such units. If pump and motor are not fully submerged at shut off level, explosion proof motors shall be provided.
2. The pump body, seal plates, impeller, and motor housing shall be constructed of high quality ASTM Class 30 cast iron or better. A coat of air dry enamel shall be applied before and after assembly. All exposed hardware shall be 300 series stainless steel.
3. The impeller shall be of the two-vane, non-clog design with pressure vanes on the back side and of the key drive design. The impeller shall be dynamically balanced and shall be capable of handling solids, fibrous materials, and other matter found in normal sewage applications. A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller.
4. Each pump shall be provided with a tandem mechanical shaft seal consisting of two independent seal assemblies operating in an oil-filled seal cavity. The materials of construction shall be carbon and ceramic lapped and polished to a tolerance of one light band, stainless steel hardware, and with all rubber parts of Buna-N. A moisture sensor detection system shall be included within the oil-filled seal chamber.
5. The motor shall be a premium efficiency motor that is the standard product of an established American motor manufacturer. The motor shall be designed to be non-overloading over the entire pump curve. The rotor and stator assembly shall be of the standard frame design. The motor housing shall be of submersible construction and shall be filled with high dielectric oil. The motor windings shall be of Class F insulation rated at 155 degrees C. The combined service factor shall be a minimum of 1.15. The motor shall be able to operate dry without damage while pumping under load. The motor shall meet the standard for enclosure, type of mounting and basic electric design for NEMA Design B. The motor shaft shall be of 416 stainless steel, or carbon steel with a replaceable type 420 stainless steel shaft sleeve. The thrust bearing shall be of the double row ball type with the upper radial bearing of the single row ball type.
6. Thermal sensors shall be used to monitor stator temperatures. The stator shall be equipped with a thermal switch embedded in the end coil of the stator winding. This shall be used in conjunction with and supplemental to external motor overload protection and wired to the control panel.
7. The pump shall be equipped with adequate power cord and sensor cord to connect the pumps to the control panel. Pump motor cords shall be designed for flexibility and serviceability under conditions of extra hard usage and shall meet the requirements of the NEC for flexible cords and cables in sewage pumping stations. Each flexible cable, or cord, shall be provided with a watertight seal and separate strain relief at the motor.
8. The cable entry design shall be such that it insures a watertight and submersible seal. All incoming lead wires shall be spliced in the motor terminal housing. After splicing, the terminal housing shall be filled with epoxy to seal the outer cable jacket and the individual strands to prevent water from entering the motor housing. In lieu of the epoxy seal, a terminal board shall separate the junction chamber and motor. A secondary rubber pressure grommet shall be provided as an additional sealing point and strain relief at the point of cable entry.

C. Pump Lift-Out Assembly: For each pump, the discharge connection elbow shall be permanently installed in the wet well along with the discharge piping. The pump(s) shall be automatically connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection and service. There shall be no need for personnel to enter the wet well. A simple linear downward motion of the pump shall accomplish sealing of the pumping unit to the discharge connection. A stainless-steel sliding guide bracket shall be an integral part of the pump unit. Two stainless steel guide rails shall guide the entire weight of the pumping unit. Provide stainless steel lifting chain of appropriate diameter for pump size, length as required for the installation (minimum of 50 feet), for each pump. Provide a stainless-steel hook underneath the access cover for attaching the cables.

2.4 Access Covers

A. Access covers shall be aluminum, designed and constructed to withstand water intrusion.
B. The doors shall be minimum 1/4" aluminum tread plate reinforced as required and attached to the frame with stainless steel hinges. A lock tab for pad locking shall be provided for securing the door closed. A positive guided open-door latch shall engage automatically when door is fully opened to 90 degrees. The open-door latch must be released for closing. A retractable handle shall be provided on the outside of the door to assist opening and closing. Access hatches are to be Halliday Model W1S single leaf or W2S multi-leaf or Owner approved equal. Wet well access shall be multi-leaf to provide adequate access for pumps.
C. All wet well hatches shall be provided with a safety grate which allows visual inspection of the wet well with the grate in place. The grate shall have a separate hold open door latch that engages when fully opened to 90 degrees. The door latch shall have a release mechanism. Safety grate and latches shall be made from stainless steel or aluminum and be resistant to sewage, sewer gasses and moisture.
D. Access dimensions shall be adequate for maintenance of equipment, accommodating removal of equipment when necessary.

2.5 Wet Wells, Valve Vaults and Meter Vaults

A. Construct wet wells of precast reinforced concrete sections. Wet wells constructed of steel are not allowed.
1. Bases shall be one-piece precast base or cast-in-place concrete base section constructed to the dimensions shown on the Drawings and in accordance with ASTM standards. Steel reinforcement shall be as delineated on the Drawings and in accordance with ASTM Standards.
2. Risers shall be precast reinforced concrete riser sections in accordance with ASTM C478, constructed to the dimensions shown on the Drawings and in accordance with ASTM Standards. Riser shall be the same dimensions as the base. Riser steel reinforcement shall be designed for the designated depth of the structure per ASTM standards. At each joint between precast manhole sections, provide a permanent, flexible, watertight, full perimeter external joint wrap in accordance with ASTM C-877, Type II and passing ASTM C-1244 vacuum test. Wrap shall be as manufactured by Mar Mac Construction Products, Inc. or Owner approved equal.
3. Gaskets for sealing precast sections shall be preformed gaskets conforming to Federal Specifications SS-S00210, Type I Rope Form, or Kent Seal Mastic.
4. Resilient gasket pipe-to-manhole connectors, manufactured in accordance with ASTM C-923, shall be provided.
5. Risers shall not have through-wall lift holes. All lift holes in precast sections shall be wetted and completely filled with non-shrink grout, smoothed.
6. Top slabs shall be one-piece precast concrete, constructed to the dimensions shown on the Drawings and in accordance with ASTM standards. Top slab steel reinforcement shall be designed for the designated surface load of the structure per ASTM Standards.
7. Manholes exterior shall be coated with bituminous waterproofing material to ensure water tightness.
8. Furnish and install manhole steps at 16 inches on center in the valve vault. Provide plastic steps with steel bar reinforcement, as manufactured by M.A. Industries, or equal.
9. Provide a 2-inch minimum PVC drain from the valve vault to the wet well. Equip the drain with a check valve in the wet well to prevent backflow into the valve vault. Slope the floor of the valve vault to drain.
10. Wet Well concrete shall have an antimicrobial admixture.
a. Antimicrobial Admixture: 1 gallon per cubic yard of concrete of ConmicShield® by Conshield Technologies Inc or Owner approved equal. Additive shall be included in the concrete mix design as part of the total water content. The additive shall be added to the concrete mix water to ensure even distribution throughout the concrete mixture.

2.6 Valves

A. Check valves shall be Swing-Flex Check Valve or Owner approved equal. Valve shall be equipped with a manual backflow actuator for manual backflow operation.
B. Isolation valves shall be resilient seat wedge type with a square actuator nut for operation. Valve shall be designed for wastewater operations. The operating stem for the valve shall extend close to the top of the valve vault. The vault shall have a monument box installed and centered over the valve nut, so that the valve may be operated from the surface.
1. Manufacturers: Val-Matic, Mueller, Clow, or Owner approved equal.

2.7 Pressure Gauges:

A. Provide a 2-inch saddle tap downstream of where the pump force mains join. Install a 2-inch stainless steel ball valve and a 2-inch x 1-inch stainless steel bushing with a 1-inch stainless steel pipe nipple and a 4 1/2 in. diameter, 0 to 60 psi, Bourdon tube type pressure gauge with shut-off cocks, as shown on the plans.

2.8 Electromagnetic Flow Meter

A. The following details apply to the flow meter, if requested.
B. Approved Manufacturers:
1. ABB – Magmaster MFE Series Model
2. Krohne – AquaFlux Model
3. Owner approved equal
C. Furnish and install a pulsed DC electromagnetic flow meter for flow measurement. The flow meter shall consist of a flow tube and a converter, which shall indicate, totalize and transmit flow to a digital recorder. The flow tube shall use a spool piece configuration with field-interchangeable sensors containing coils and electrodes. The flow tube shall not require removal from service in order to repair/replace liners or repair/replace coils. Magnetic flow meters requiring liners will not be acceptable.
D. Provide and install flange adapter in the main line and provide spool piece (left in the meter vault) the length and diameter of the magnetic flow meter.
E. The magnetic flow transmitter shall be furnished with a digital LCD display for flow rate, a six digit totalizer, alarm relays and 4 to 20 mA analog output. The meter shall include digital data logging for a minimum of 60 days.
F. The flow tube shall be EMCO UniMag M carbon steel flanged Flow Tube, furnished with two UniMag sensors for 0.5% accuracy. The flow tube construction shall be suitable for submersible operation with a remote transmitter installation. Each flow sensor shall contain a coil, a pair of sensing electrodes, and an integral grounding electrode. The sensors shall use pulsed DC excitation.
G. The flow tube shall be installed in a meter vault as shown on the plans. The transmitter and digital recorder shall be installed in the electric control panel specified in these specifications.
H. Provide a minimum 1/3 horsepower, 115 vac sump pump in the meter vault if it cannot be drained by gravity. Provide a water in vault alarm.

2.9 Portable Pump Connections

A. The valve vault shall contain a 6-inch bypass ductile iron riser that extends above the pad on the valve vault with a cam-lok fitting. Isolation valves for bypass pumping should be accessible from on top of the pad.
B. A 6-inch ductile iron suction pipe shall be installed in the wet well for use in emergency pumping situations. The suction pipe shall be supported off the wall of the lift station and terminate above the pad with a cam-lok fitting.

2.10 Permanent Mounted Bypass Pump (if Required by Owner)

A. Permanent pump required if lift station has a capacity of 250 gpm or greater.
1. Manufacturer to be Godwin, Thompson or Owner approved equal.
B. Pump shall start automatically via the redundant float backup.

2.11 Control Panel

A. The control panel(s) shall be constructed in compliance with Underwriter's Laboratories Categories 698A and 913 standards – "Enclosed Industrial Control Panel Relating to Hazardous Locations with Intrinsically Safe Circuit Extensions".
B. While the use of U.L. listed components is encouraged, their use alone and/or the alternate use of a U.L. 508A – "Enclosed Industrial Control Panel" serialized label will not be considered an acceptable or satisfactory alternate to the "Enclosed Industrial Control Panel Relating to Hazardous Locations with Intrinsically Safe Circuit Extensions" serialized label specified above.
C. Upon request from the Owner, the Contractor shall supply documentation from the control panel manufacturer to the Owner demonstrating that the manufacturer is a U.L. recognized manufacturing facility for the type of equipment required. Only the labeled products of U.L.698A and 913 "Enclosed Industrial Control Panel Relating to Hazardous Locations with Intrinsically Safe Circuit Extensions" recognized panel manufacturer shall be considered acceptable.
D. Provide a NEMA 4X, 14 gauge, stainless steel enclosure with dead front door. Enclosure shall be of appropriate dimensions for the equipment provided. All hardware and hinges shall be stainless steel. Chassis plates shall be .125" grade 6061-T6 aluminum. Each door shall have a drip shield, continuous hinge door with 3-point latching mechanism. The latching mechanism shall be a lever type locking device (lockable exterior door), no screw down clamps shall be allowed to secure door. The enclosure shall have a separate section for controls as described below. Reserve 12 inches below each enclosure for conduit entrance. The panel shall be supplied by pump manufacturer, or Owner approved equal.
E. Provide the following equipment in the power section of the enclosure:
1. Main circuit breaker or disconnect.
2. Branch circuit breakers for each pump motor.
3. NEMA Size motor starters with Type 10 overload relays for each pump motor.
4. Low voltage relay for single phase electrical service applications or phase failure relay for three phase electrical service applications, each with integral surge protection, to provide motor and control equipment protection in the event of low voltage, voltage unbalance, phase loss, or phase reversal.
5. Phase/Voltage monitor.
6. Lightning Arrestor.
7. Incoming power terminal block.
8. Ground fault interruption protection shall be provided to de-energize the circuit in the event of any failure in the electrical integrity of the cable to each motor.
9. LED Panel Light
10. Site lighting circuit breaker
11. Control Power Transformer with Primary Fuses.
12. Control Power Circuit Breaker and Fuse.
13. Motor heat sensor circuits.
14. Individual pump Ammeter.

F. Provide the following equipment in the control section of the enclosure:
1. Telemetry Circuit, 15A, single pole circuit breaker 120V GFI
2. Spare Circuit 20A, single pole circuit breaker and 20A, 120V GFI duplex receptacle.
3. Control Circuit, 15A, single pole circuit breaker for controls.
4. Circuit breakers as required for all other power needs.
5. Level controller with isolation transformer.
6. Hand-Off-Automatic (H-O-A) switches for each pump.
7. Run lights (green) push-to-test for each pump.
8. Run failure lights (red) push-to-test for each pump.
9. Seal failure lights (amber) push-to-test for each pump.
10. Elapsed time meters (99999.9 hours) for each pump.
11. Primary transducer, intrinsically safe, 4-20 Ma output
12. Back-up float control relay intrinsically safe, to automatically operate the pumps in the event of level controller failure. This relay shall also activate the high water alarm and alarm light.
13. Panel heater with thermostat.
14. Omni-site Crystal Ball Micro RTU, Wireless Alarm Monitor, with 12V DC power supply and battery backup, if requested by Owner.
15. A digital data logger shall be installed in the control cabinet, if requested by Owner.
16. Magnetic flow meter transmitter for use with remotely mounted Magnetic flow tube, if requested by Owner. Provide 120 vac, 1 pole, 15 amp circuit breakers for the flow transmitter, if requested by Owner.
17. Red alarm light, test push button (NO HORN).
18. 22 mm LED Indicating Lights, NEMA Type 4/4x/13 IP66 suitable for wash down environments.
19. 22mm oil tight lenses.
20. ETM's (Elapsed time meters)

G. Solderless, marked terminals shall be used for control wiring. Mount control devices on the inner door within the enclosure. The seal failure sensor shall be wired to relays to activate seal failure lights. The heat sensing thermostat in the motor windings shall be wired in series to the motor starters.
H. On the outside of the enclosure mount the following:
1. High Water Alarm LED Light, red in color.

2.12 Pump Station Controller

A. Furnish a NE250 (VFD pump controller) or NE152 (non-VFD pump controller) general-purpose pump controller designed to control up to 2 pumps in pump down applications. The controller shall have an integral programmable logic controller (PLC) and human machine interface (HMI) unit in one. It sequences pumps on and off in response to changes in level, pressure, or flow. The primary sensor input is a 4 to 20 mA current loop, which can be connected to any sensor which has a 4 to 20 mA output connected to a pressure transducer. The controller also allows for a float backup system.
It is the intention of this specification that a standard controller be provided, with all the control and communications features described as a fully integrated assembly. The controller shall be manufactured by N.E. Controls LLC (315) 299-5161 https://www.necontrols.com/ (7048 Interstate Island Rd Syracuse, NY 13209) or Owner approved equal.
B. The pump controller shall be a standard, catalogued product of a water and wastewater pumping automation equipment manufacturer regularly engaged in the design and manufacture of such equipment. The PUMP CONTROLLER shall be specifically designed for wastewater pumping automation utilizing built-in preconfigured control and telemetry strategies allowing pump up or down mode pump control of 1 to 2 pumps. "One of a kind" systems using custom software with a generic programmable controller will not be acceptable.
C. The pump controller shall be able to operate on either 120 AC or 10–30 VDC power sources. The unit shall be battery backed to provide continued system monitoring and alarm annunciation in the event of primary power failure. Unit shall have built in battery charging circuitry to maintain and charge battery. Battery shall be sized to provide a minimum of 4 hours of backup power. Back up battery power will extend to necessary process sensors, local alarm lights, horns and telemetry equipment. A power on LED shall be built on board providing local indication that power is available to the unit.
D. The pump controller shall be furnished with a user-friendly touchscreen operator interface allowing adjustment and viewing of all system parameters and status. The operator interface shall be NEMA 4X rated suitable for front door mounting including locations requiring wash-down and moisture protection.
1. The process variable signal, pump 1, 2 on/off and high & low set points, shall be displayed simultaneously via front panel mounted long lasting Ultra Bright LED bar graphs. These bar graphs shall be vertically mounted in parallel fashion to provide relational viewing of all set points vs. the measured process. Each display column shall have a minimum of 40 segments of resolution. Each set point column shall have a status LED mounted on top of the associated set point providing indication of set point activation status. Units that require operator action to view the above parameters are not acceptable.
2. To assure the highest resolution and accuracy, the process display shall be configured to display the full range of the actual measured process. Range can also be offset allowing display of a pressure or level range that does not start at zero. The display ranges shall

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HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

HENDRICKS COUNTY
REGIONAL SEWER
DISTRICT

SPECIFICATIONS

KAREN C. SKAVDAHL
REGISTERED
No.
PE11500679
STATE OF
INDIANA
PROFESSIONAL ENGINEER

CERTIFIED BY

ISSUANCE INDEX

DATE:
04/30/2021

REVISION SCHEDULE

NO.	DESCRIPTION	DATE
1	SHEET ADDED	12/10/2018
3	REVISIONS TO: AIR RELEASE VALVE LATERAL CONNECTION TO EXISTING SEWER	01/03/2019
4	DETAIL AND LIFT STATION SPECIFICATIONS UPDATES	01/21/2021
SPECIFICATIONS		
1	UPDATED TESTING REQ. PER IDEM COMMENTS	01/20/2017
2	UPDATED TESTING REQ. PER IDEM COMMENTS	12/10/2018
3	GENERAL REVISIONS	01/03/2019
4	ASTM REFERENCE	08/05/2019

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STANDARD
LIFT STATION
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01

be field configurable.

3. System Pump On/Off and Alarm set point parameters shall be easily adjustable via individual up and down pushbutton arrows located next to the associated set point display column(s).
4. The unit shall have a built-in process simulation capability allowing the operator to verify system operation by forcing the process variable up or down via pushbutton arrows located next to the process display. To prevent accidentally leaving the unit in simulation mode, the PUMP CONTROLLER shall be configured to automatically restore monitored process display within 2 minutes after last keypad usage or immediately upon operator initiated restore.
5. The display unit shall incorporate a high contrast LCD panel allowing for viewing of higher level functions including the following:
   I. Process display to XX.X of the full scale process range.
   II. Time and Date Stamped Alarms & Events
   III. Pump Statistics (Including Run Time, Number Of Starts, Daily Average Number Of Starts)
   IV. System diagnostics
   V. Controller Security
   VI. Unauthorized Station Entry Detection

E. The pump controller shall provide on board 24 VDC loop power output for external loop powered sensor. A built-in Analog Supply Voltage Status LED shall indicate availability of loop power. Unit shall be able to monitor a user selectable – 4-20 mA or 0-10 Volt analog input representing the process to be controlled. The analog digital conversion shall not be less than 16 bit to allow accurate measurement of the process variable. The analog input circuitry shall provide optical isolation from the main board to the field device. A minimum of 1000 volts electrical isolation shall be required. The analog process signal shall be displayed locally via 40 segment vertical LED display and the LCD digital display as specified above. This signal shall also be available for telemetry transmission.

F. The pump controller shall have the ability to monitor up to 16 digital inputs to be used to provide monitoring of local station status. Each discrete input shall provide optical isolation from the main board to the field device. A minimum of 1500 volts electrical isolation shall be required. An on board LED shall be provided indicating that digital input isolation is not compromised. All discrete inputs shall be available for telemetry transmission. The following inputs shall be monitored:
1. Pump 1, 2 Run – This signal shall be used to provide local display of pump run status, pump total run time, and pump average daily starts for each pump.
2. Pump 1, 2 In Auto – This signal shall be used by the controller to determine pump availability. A pump in this mode cannot be called into operation.
3. Pump 1, 2 High Temperature/Seal Failure – This signal shall be used by the controller to disable the pump required when a High Temperature is the cause of the failure, and provide local alarm display. Controller shall be able to differentiate alarm. A seal failure shall not disable pump operation.
4. High & Low Float/Pressure – This signal shall be used by the controller to provide back up control of the pumps in the event of primary (analog) sensor failure.
5. Pump Inhibit – This signal shall be used by the controller to inhibit pumps from operating.
6. Power Quality – This signal shall be used by the controller to disable pumps in the event incoming station power is unsuitable for use as determined by an optional external power monitoring device.
7. Alarm Silence – This signal shall be used by the controller to monitor an optional external silence push button and will temporarily disable the alarm horn output.

G. The pump controller LCD shall operate in a manual scrolling menu mode with the various displays shown in sequence as selected by the keypad's up/down arrow keys. The display shall indicate the specific function entered on the keypad to confirm that selection of a particular output or other function from the keypad during adjustment or review routines.

H. The pump controller shall provide outputs for interface to local pumps and alarm annunciation equipment. Relay isolated contact outputs for activation of Pump 1 and Pump 2. Common Alarm shall be provided. Each contact shall be rated for a minimum of 10 amps at 120 VAC or 5 Amps at 240 VAC. Open collector outputs for Low and High Level Alarm shall be provided for interface to off board monitoring equipment. Open collector outputs shall have a minimum operating range of 5-30 VDC @ 100 mA.

I. The pump controller shall provide 4-20 mA output signal for interface to external equipment including VFDs, flow meter or other monitoring devices. Analog output can be configured to provide output representing process variable for retransmission or as a process control output for interface to VFDs, valves, or other process-controlled device.

J. The pump controller shall support contact closure inputs from float or pressure switches representing high and low (Level/Pressure). The pump controller shall annunciate these inputs as alarms and use them to provide back up control in the event the primary (analog) sensor fails. Unit will provide local alarm indication and utilize the inputs to cycle pumps on and off to maintain system operation.

K. The pump controller shall include built-in pump failure detection logic. In the event the pump has been called into operation and the pump run signal is not received within a pre-adjustable time period. A motor failure shall be produced. The failed motor shall be disabled, an alarm shall be displayed and the next available pump based on the selected alternation sequence shall be requested to start.

L. PUMP CONTROLLER shall provide pump performance related information. Pump station performance data shall be viewable locally through built in LCD or available for telemetry transmission to master station. The following information is to be provided:
1. Pump 1, 2 Low Flow Rate Alarm (Set point) – each pump
2. Pump 1, 2 Run Time – each pump
3. Pump 1, 2 Number Of Starts – each pump
4. Pump 1, 2 Average Number Of Starts – each pump

M. All connections shall be made via plug-in terminal blocks with a minimal rating of 10 amps, 300 volts and capable of accepting 30-12 AWG wire.

2.13 Level Device System

A. The liquid level of the wet well shall be sensed by a submersible level pressure transducer device. The level device shall be Dwyer Instruments, Inc. PBLTX-5-50-PU or Owner approved equal.
B. The level device shall be provided with a 50 foot cord.
C. The level device assembly shall be installed where directed by the Engineer and connected with other system elements and placed in successful operation.
D. The control panel shall include a UL Listed intrinsic safety barrier that has been UL tested with the specific submersible level device furnished for this application to render the level device suitable for use in Class 1, Division 1 or 2, Groups A, B, C and D; Class II, Division 1 or 2, Groups E, F and G; and Class III, hazardous locations (which includes a sewage wet well).

2.14 Redundant Float Back-up

A. An independent high level alarm and redundant pump control capability with features as hereinafter listed shall be provided in addition to the specified primary control system. It shall be powered by a 120 VAC circuit breaker.
B. The high level alarm shall be a float system that activates when the float rises 45-degrees.
C. The independent alarm/control panel equipment shall be designed to UL Industrial Control Panel standards and shall incorporate 120 VAC input power transient protection, a fused primary and a DC power supply with limited 12 VDC to power the intrinsic safety barrier level sensing float circuit(s). The front face of the controller accessible through the operator's door and shall incorporate four red LED indicators; a "control hold" LED, a redundant control "turn on" LED, a high level alarm/monitor LED, a "control contacts" energized LED and a pump "off delay" time control adjustment with a 0-5 minute range.
D. The controller shall operate in conjunction with necessary direct-acting float switches (as specified elsewhere) to provide back up control of lift pumps, detection of high level and to protect the pumps from damage that may result from low wet well levels. The system shall monitor the float switch inputs and provide local indication of system operation via LEDs. Built in relay contacts shall be interfaced to alarm circuitry and pump motor starter pilot circuitry. The backup system shall not interfere with primary controller operation when wet well levels are within normal operating range. The backup system will only become active, and bypass the primary control and sensor system and assume full control, in the event wet well levels go outside of normal operating range. Back up sensors shall be mounted and configured to operate outside primary controller set point settings.
E. Upon detection of abnormally high wet well level the backup system shall provide independent dedicated high level alarm indication and contact closure output for activation of common alarm system. The backup system shall also provide independent dedicated control output active indication and dual isolated outputs suitable for direct interface to motor starter pilot circuits to activate both lift pumps. The high level alarm signal shall be deactivated upon lowering of wet well level below the high alarm sensor. The pumps will remain on until wet well level drops below a separate pump off sensor. Pump off sensor shall be mounted at a level that is below the normal operating range of the primary controller set point setting.
F. The contractor shall furnish, install, and wire the float switches as shown on the drawings. Each float shall have molded polyethylene body, internal redundant polyurethane foam flotation, potted switch and cable connections and fine-stranded AWG #18 cable with heavy-duty synthetic rubber jacket in lengths as required to run unspliced to the control panel. The floats shall include internal weight allowing suspended operation without the use of special pipe or suspension mounting systems.
G. Float switches shall be provided by the control panel supplier. They are to be a catalogued item of the control panel manufacturer. The float bracket shall be made of stainless steel.

2.15 Alarm/Data Monitoring

A. A microprocessor-based monitor unit shall be provided for monitoring and control of the lift station based on alarm contact closures, universal voltage input signals, 4-20mA signals and relay outputs.
B. The microprocessor-based monitor shall be a standard, catalogued product of a water and wastewater equipment manufacturer regularly engaged in the design and manufacture of such equipment. The pump/alarm monitor shall be specifically designed for wastewater pumping automation utilizing standard hardware and software. "One of a kind" systems using custom software with a generic programmable controller or pieces from many manufacturers that are "integrated" together will not be acceptable. The controller shall be Crystal Ball ™ as mfg. by Omni-site, Inc. or Owner approved equal.
C. The controller shall accept (14) universal DI configurable to monitor dry contacts or any voltage range between 12VDC/VAC to 120 VAC/VDC or to act as pulse counters; (4) 4-20 mA isolated analog inputs, (4) 20 amp relay outputs, (1) rain gauge input, and (1) crew on-site intelligent key reader input in its base form, and the ability to monitor up to two IP enabled infrared cameras. It shall have Phoenix type removable terminal blocks. One additional expansion I/O module can be added providing an additional (10) universal DI voltage inputs, and (4) 4-20mA inputs.
D. Gel Cell Battery: On-board 12VDC, 800mAH gel cell battery provides backup for up to 24 hours in the event of power loss. Battery is automatically recharged using temperature compensated floating battery charging Circuit.
E. The controller shall monitor and transmit the following points:
1. Power Fail
2. High Wet well Level
3. Bypass Pump Run
4. Bypass pump Fail
5. Pump 1 Seal Fail
6. Pump 2 Seal Fail
7. Pump 1 Run
8. Pump 2 Run
9. Pump 1 Thermal Fault
10. Pump 2 Thermal Fault
11. Pump 1 Elapsed Time
12. Pump 2 Elapsed Time
13. Float Backup Mode
14. Pump 1 Amp Draw
15. Pump 2 Amp Draw Level
16. Pump Station Flow
17. Level Device Fail
18. One (1) year cellular service thru Omni-site/Verizon shall be included with each unit.

2.16 Additional Electrical Materials

A. Grounding for chain link fence shall consist of 3/4 inch diameter by 10 feet long copper clad steel ground rods connected to each corner post with minimum No.6 copper bonding jumpers, also used to tie each mesh fence section to its adjacent post and horizontal bottom and top support pole section. Each of the gates mesh fence sections shall be tied to its respective horizontal and vertical support poles. The hinged side vertical support pole of each gate section shall be tied to its adjacent fence post with a flexible No.6 copper bonding jumper. The fence grounding system shall be bonded to the electrical service ground triangle.
B. The ground triangle for service entrances and all equipment shall be constructed of three 3/4 inch diameter x 10 feet long copper clad steel ground rods bonded together with a minimum No.6 bare copper conductor, (typical for 100 amp service, larger services require larger grounding/bonding conductors) attached to each ground rod with utility company approved ground clamps or exothermic weld. Resistance to ground shall be 10 ohms or less.
C. Electrical conductors shall be solid or stranded copper, rated for 600 vac, with type THHN-THWN or XHHW insulation.
D. Instrumentation cable shall be two conductor No. 16 awg twisted pair, stranded copper conductors with PVC insulation, aluminum polyester or aluminum mylar tape shield, or braided copper shield, tinned copper drain wire, black PVC overall jacket, 300 v working class.
E. The lift station pumps power and wet well level device and float switches control junction boxes shall be aluminum or non-metallic, NEMA 4X, single door enclosures, capable of being padlocked. The pumps power junction box shall have an aluminum isolation divider providing a section of the junction box for control and low voltage sensor control wiring.

2.17 Site Requirements

A. Concrete Pad: Contractor shall install a concrete pad around the wet well and valve vault as shown in the most recent HCRSD standard detail.
B. Fence: Contractor shall install a chain-link fence around the lift station site with a vehicle-access gate as manufactured by Merchants Metals, www.merchantsmetals.com or Owner approved equal.
   a. Steel chain link fabric: 6-feet high. Class 2b fused and adhered, 2" or tighter, 9 gauge core, green, knuckle/twist selvage.
   b. Round steel pipe fence framework: Round steel pipe and rail: Cold-rolled electric-resistance welded pipe in accordance with ASTM F1043 Materials Design Group IC (LG-40), minimum steel yield strength 50,000 psi. Type B external coating, hot dip galvanized zinc 0.9 oz/ ft² with a clear polymeric overcoat, Type D interior 90% zinc-rich coating having a minimum thickness of 0.30 mils).
      1. Line post: 1.900" min. – 2.375" max. LG-40
      2. End, Corner, Pull post: 2.875" min., LG-40
      3. Top, brace, bottom and intermediate rails, 1.660 in. OD: LG-20 or heavier.
   c. Tension Wire: COLORBOND® Polymer Coated Steel Tension Wire: 7 gauge core (0.177 in.) wire complying with ASTM F1664. Match color to that of the chain link fabric. Class 2b, fused and adhered.
   d. Fittings
      1. Tension and Brace Bands: Galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12 gauge (0.105 in.), minimum width of 3/4 in. and minimum zinc coating of 1.20 oz/ft² . Secure bands with 5/16 in. galvanized steel carriage bolts.
      2. Terminal Post Caps, Line Post Loop Tops, Rail and Brace Ends, Boulevard Clamps, Rail Sleeves: In compliance to ASTM F626, pressed steel galvanized after fabrication having a minimum zinc coating of 1.20 oz/ft².
      3. Tension Bars: In compliance with ASTM F626. Galvanized steel one-piece length 2 in. less than the fabric height. Minimum zinc coating 1.2 oz. /ft. Bars for 2 in. and 1 ¼ in. mesh shall have a minimum cross section of 3/16 in. by 3/4 in.
   e. Tie Wire and Hog Ring: Polymer coated COLORBOND®, match the coating, class and color to that of the chain link fabric.
   f. Swing Gates: Galvanized steel pipe welded fabrication in compliance with ASTM F900. Gate frame members 1.900 in. OD LG-20 or heavier. Frame members spaced no greater than 8 ft. apart vertically and horizontally. Welded joints protected by applying zinc-rich paint in accordance with ASTM Practice A780. DAC Strong Arm gate latch, pressed steel galvanized after fabrication. Galvanized malleable iron or heavy gauge pressed steel post and frame hinges. Gate fabric is to match that of the described fence system. Gate Post, both hinge and latch, are to be no less than 2.375 in. in diameter for gate widths up to and not exceeding 48' in width. Hinge post for single gates wider than 4' and not exceeding 5' in width are to be no less than 4in. in diameter. All post weight is to be no less than LG-40. COLORBOND® Polymer coated gate frames and gateposts; match the coating type and color to that specified for the fence framework.
   g. Concrete: Concrete for post footings shall be wet mixed and poured. No less than a 4,500 psi mix is to be used on all posts.

PART 3 - EXECUTION OF THE WORK

3.1 General

A. Refer to HCRSD Standard Specifications for Sanitary Sewer for applicable requirements regarding site preparation, sewer and water separation requirements, trench excavation and maintenance, bedding and backfill, pipe laying and site cleanup and restoration.
B. Install lift station, alarms and controls in accordance with manufacturer's instructions and applicable standards. Equipment and wiring shall be installed in a neat, workman- like manner by skilled workers. Conduits shall be rigidly supported.
C. All wires shall be labeled.

3.2 Electrical Work

A. Perform all electrical work as required for the installation of all electrical and process equipment as indicated in these specifications.
B. All electrical work shall be performed in a neat and workman like manner in accordance with the provisions of The National Electrical Code (NEC), the guidelines of The National Electrical Safety Code (NESC), and the installation standards of The National Electrical Contractors Association (NECA), and applicable local codes.
C. All conduit above ground shall be Aluminum Electric Metallic Tubing (EMT) conduit. All conduit below ground shall be heavy wall PVC. Minimum conduit diameter shall be 1/2 inch.
D. Junction Boxes
1. Separate junction boxes shall be provided for pumps power/sensor cables and for wet well level device and float switch control cables.
2. The lift station control enclosure shall be protected by explosion proof epoxy conduit seal off fittings located in the conduits from the pumps power/sensor junction box and from the controls junction box to the lift station control panel enclosure, to prevent the atmosphere of the wet well from gaining access to the lift station control panel. This allows for the disconnection and removal of any of the pumps, the wet well level device or any of the float switches without disturbing the seal. The conduits from the pumps power/sensor cable junction box and from the wet well level device and float switches junction box to the wet well shall be sealed with OZ-Gedney type CSBG conduit seal fittings.
3. Pump power/sensor cable in conduit shall be installed from the wet well to the pumps power/sensor cables junction box for each pump. Pump power conductors shall be installed in conduit from the power/sensor cables junction box to the lift station control enclosure for each pump. Pump sensor conductors shall be installed in conduit from the power/sensor cables junction box to the lift station control enclosure for each pump. Conduits shall be a minimum of 4-inch for power lines to the pumps. All conductor to cable terminations in the pumps power/sensor junction box shall be made with waterproof connections.
4. Wet well level device cable in conduit shall be installed from the wet well to the controls junction box. Wet well level device conductors shall be installed in conduit with epoxy conduit seals from the controls junction box to the lift station control enclosure. Float switch cables (4) shall be installed in conduit from the wet well to the controls junction box. Float switch conductors shall be installed in conduit with epoxy conduit seals from the controls junction box to the lift station control enclosure. All conductor to cable terminations in the controls junction box shall be made with waterproof connections. Additional float switch cables from the wet well to the controls junction box may be installed in the same conduit as the wet well level device cable.
5. Individual conduit with sump pump power conductors and an individual conduit with manufacturer's flow transmitter interconnecting cable shall be installed from the lift station control enclosure to the valve and flow meter vault as needed. These conduits shall be equipped with explosion proof conduit seal-off fittings prior to entering the lift station control enclosure.
6. All explosion proof conduit seal-off fittings shall be properly sealed to exclude the wet well atmosphere from the interior of the lift station control enclosure.

E. Manual Transfer Switch
1. The conduit between the manual transfer switch and the lift station control enclosure shall be Aluminum Electric Metallic Tubing (EMT) conduit.

F. Main Disconnect Switch
1. The lift station main fused disconnect shall be a heavy duty fused switch in a NEMA 4X enclosure.

G. Install the lift station control enclosure on a control panel rack per detail.

3.3 Pumps

A. Set pump discharge elbows level and plumb for proper pump operation. Install guide rails plumb to prevent binding of pump upon removal.
B. Install piping plumb and level. Support valves and piping in wet well and valve vault as indicated in the standard details.

3.4 Fence

A. Install fence per manufacturer's instructions.

3.5 Lift Station Testing

A. The force main and all gravity sanitary sewers constructed as part of the project shall have passed all required tests prior to the startup and final acceptance of the lift station.
B. Wet Well Leakage Testing. All wet wells shall be watertight and free from leakage. The wet well shall be visually inspected for leakage by the Owner after assembly and backfilling. All dewatering activities shall be ceased a minimum of eight (8) hours prior to the leak testing. If the wet well shows signs of leakage, it shall be repaired to the satisfaction of the Owner and re-inspected.
C. All equipment testing shall be observed by the Owner during the lift station's final inspection. Partial testing will not accepted. The testing must be done on the complete lift station. It is not the Owner's responsibility to engage in ANY activity or supply ANY equipment to test and/or accept the lift station. The Contractor shall provide the clean water to run the pumps and perform all tests. The startup and final inspection shall be as follows:
1. The waiting period shall be after BOTH of the following:
   I. AFTER the force main, gravity sewers and manholes constructed as part of the project have passed all required tests
   II. After ALL equipment has been installed, been determined to be in working order by the Contractor and manufacturer and been previously tested by the manufacturer.
2. Equipment: The Contractor or manufacturer shall provide all necessary equipment to safely complete all the tasks necessary to test and accept the lift station.
3. Testing Procedures: A lift station checklist provided by the Owner shall be completed during the start-up and final inspection. The test shall verify all equipment performs in accordance with the design and the requirements of this Specification. Procedures for each component shall be determined by the Owner at the time of startup. At a minimum, the following shall be tested:
   I. Pumping rate for all pumps in gpm;
   II. Communications equipment;
   III. Controller;
   IV. All electronic equipment;
   V. All mechanical equipment;
   VI. All instrumentation and control equipment;
   VII. Incoming power;
   VIII. The overall operating condition of the lift station; and
   IX. Any other test the Owner deems necessary.
4. Calibration: All measuring equipment supplied for the lift station shall be calibrated prior to acceptance. Calibration test results shall be made available upon request. The measuring equipment shall include at a minimum the following:
   I. Level Devices;
   II. Flow Meters;
   III. Gauges; and
   IV. Other equipment as deemed necessary by the Owner.
5. Determination of Lift Station Acceptance If the station performs to the satisfaction of the Owner, as designed, and per the requirements of this Specification, the lift station shall have passed the test.
6. Determination of Lift Station Failure If the station does not perform to the satisfaction of the Owner, as designed, and per the requirements of this Specification, the lift station shall have failed the test. The Contractor shall be required to correct all deficiencies and retest.

3.6 Pump Warranty

A. Pump warranty shall be provided by the pump manufacturer and shall warrant the units against defects in workmanship and materials for a period of five (5) years under normal use, operation and service. The warranty shall be in printed form and apply to all similar units. A copy of the warranty statement shall be submitted with the approved shop drawings.

3.7 Lift Station Warranty

A. Warranties for lift station and all equipment, except for the pumps, shall be three (3) years from the date of acceptance.

3.8 Post Construction

A. Refer to HCRSD Standard Specifications for Sanitary Sewer Construction Part 3 Paragraph 3.11 for post construction requirements, in addition to the following:
B. Record drawings to include field location and elevation of all above ground improvements, including but not limited to wet well, valve vault and meter vault rims, driveway and parking area, concrete slabs, buildings and enclosures, fencing and other above ground improvements.
C. Record drawings to include actual float switch elevations.
D. Record drawings to include wet well, valve and meter vault inside diameters and bottom elevations.
E. Testing to include testing pumps, controls and alarms in accordance with manufacturer instructions, to include one full pump cycle of each pump and each alarm as a minimum.
F. Spare parts as recommended by manufacturer(s).

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HENDRICKS COUNTY
REGIONAL SEWER DISTRICT

HENDRICKS COUNTY REGIONAL SEWER DISTRICT

SPECIFICATIONS

KAREN C. SAMUELSON
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Project Number 2000.00103

STANDARD
LIFT STATION
SPECIFICATIONS

02

Critical Design Criteria for Low Pressure Grinder Pump System Construction:

1. The Design Engineer shall submit a low pressure system service area map.
2. HCRSD will make the determination as to the need for improvements to downstream sanitary sewer facilities. Early coordination is recommended to eliminate delays during design.
3. Low pressure grinder pump systems (LPGPS) will only be considered in areas where sanitary sewers currently serve the surrounding areas and where conventional sanitary sewer facilities cannot be constructed.
4. Design Engineer shall submit LPGPS calculations per the manufacturer's recommendations including: calculation worksheet, individual pump curves, and make and model number of pumps.
5. Force main shall be designed per HCRSD Standards for Sanitary Sewer Construction.
6. The Utility shall be responsible for the operation and maintenance of the common force main and the portion of the lateral from the common force main to, and including, the shutoff valve.
7. The Customer/Homeowner shall be responsible for all piping, pumping equipment, and appurtenances between the building and the shutoff valve.
    a. Customer/Grinder Pump Owner is responsible for all future maintenance and replacement of grinder pump.
8. Manuals and warranty shall be provided to the Grinder Pump Owner (Customer).

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The contractor shall furnish and install a complete factory-built and tested Grinder Pumps Stations, each consisting of a grinder pump suitably mounted in a basin constructed of high density polyethylene (HDPE), electrical quick disconnect, pump removal system, shut-off valve, anti-siphon valve, and check valve assembled within the basins, electrical alarm/disconnect panel, and all necessary internal wiring and controls. All equipment specified herein and, and shown on the Drawings shall also be provided.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications:
    1. The equipment specified shall be a product of a company experience in the design and manufacture of grinder pumps for specific use in low pressure sewage systems. The company shall submit detailed installation and user instructions for this product; submit evidence of an established service program including complete parts and service manuals, and be responsible for maintaining a continuing inventory of grinder pump replacement parts.
    2. The manufacturer shall provide a reference and contact list from three of its largest contiguous grinder pump installations.

1.3 SUBMITTALS

A. Submit shop drawings for review by the Engineer showing the following:
    1. Complete description in sufficient detail to permit an itemized comparison with the specifications.
    2. Dimensions and installation requirements.
    3. Descriptive information including manufacturers' catalog cuts and specifications for all components.
    4. Electrical schematics and layouts.
    5. Hydraulic calculations demonstrating compliance with the specified hydraulic characteristics.

PART 2 - PRODUCTS

2.1 MANUFACTURER

Grinder pump station shall be Model DH071/DR071 as manufactured by Environment One Corporation, Niskayuna, New York; Zoller 810 PG pump as manufactured by Zoller Pump Company, or approved equal.

2.2 GENERAL REQUIREMENTS

A. PUMP: The pump shall be capable of delivering 15 GPM against a rated total dynamic head of 0 feet and 9 GPM against a rated total dynamic head of 138 feet. The pump must also be capable of operating at negative total dynamic head without overloading the motor. Under no conditions shall in-line piping of valving be allowed to create a false apparent head. The material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance.

B. GRINDER: The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder will be of the rotating type with a stationary hardened and ground stainless steel shredding ring spaced in close annular alignment with the driven impeller assembly, which shall carry two hardened type 400 series stainless steel cutter bars.

    a. This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks which would impair the operation of the pump.
    b. The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter stainless steel discharge piping.

c. ELECTRIC MOTOR: As a maximum, the motor shall be a 1 HP, 1725 RPM, 240 Volt 60 Hertz, 1 Phase, capacitor start, ball bearing, air-cooled induction type with a low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. This motor protector combination shall have been specifically investigated and listed by Underwriters Laboratories, Inc., for the application.

D. MECHANICAL SEAL: The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.

E. TANK AND INTEGRAL ACCESSWAY: The tank shall be made of fiberglass or high density polyethylene, with a melt index of 2.0 grams/10 minutes or lower to assure high environmental stress cracking resistance.

    a. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. Corrugations of the outside wall are to be of a minimum amplitude of 1 1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be a minimum .250 inch thick. All seams created during tank construction are to be thermally welded and factory tested for leak tightness. Tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

    b. The grinder pump station tank shall have an optimum capacity of 70 gallons.

    c. The accessway shall be an integral extension of the wet well assembly and include a lockable cover assembly mounting and watertight capability. Accessway design and construction shall enable field adjustment of station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

    d. The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak free installation no field penetrations shall be acceptable.

    e. All discharge piping shall be constructed of 304 Series Stainless Steel and terminate outside the accessway bulkhead with a stainless steel, 1 1/4 inch female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 200 psi WOG; PVC ball valves will not be accepted. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

    f. The accessway shall include a single NEMA 6P electrical quick disconnect (EQD) for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts. The accessway shall also include a 2 inch PVC vent to prevent sewage gases from accumulating in the tank.

F. CHECK VALVE: The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless steel discharge piping. The check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Moving parts will be made of a 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back-pressure. The valve body shall be an injection molded part made of glass filled PVC. Ball type check valves are unacceptable due to their limited sealing capacity in slurry applications.

    a. Each grinder pump installation shall also include one separate check valve of the type manufactured by Environment One

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STANDARD
LOW PRESSURE SEWER
SPECIFICATIONS

01

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Corporation or Approved Equal for installation in the 1 1/4" service lateral between the grinder pump station and the sewer main, preferably next to the curb stop.

G. ANTI-SIPHON VALVE: The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the stainless steel discharge piping. Moving parts will be made of 300 series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from a glass-filled thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices, due to their tendency to clog from the solids in the slurry being pumped.

H. CONTROLS: All necessary controls, including motor and level controls, shall be located in the top housing of the core unit. The top housing will be attached with stainless steel fasteners.

a. Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The level detection device shall have no moving parts in direct contact with the wastewater. High-level sensing will be accomplished in the manner detailed above by a separate air-bell sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and High-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices.

b. To assure reliable operation of the pressure switches, each core shall be equipped with a breather assembly, complete with a suitable means to prevent accidental entry of water into the motor compartment.

J. ALARM PANEL: Each grinder pump station shall include a NEMA 4X, UL listed ALARM PANEL suitable for wall mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic to assure corrosion resistance. The enclosure shall include a hinged, lockable cover, padlock, and secured dead front.

1. The Alarm Panel shall include the following features: audio & visual alarm, push-to-run switch, and high level (redundant) pump starting control. The alarm sequence is to be as follows:

2. When liquid level in the sewage wet-well rises above the alarm level, visual and audio alarms will be activated. The contacts on the alarm pressure switch will close. The redundant pump starting system will be energized.

3. The audio alarm may be silenced by means of the externally mounted, push-to-silence button.

4. Visual alarm remains illuminated until the sewage level in the wet-well drops below the "off" setting of the alarm pressure switch.

5. The entire Alarm Panel as manufactured, shall be listed by Underwriters Laboratories, Inc.

K. SERVICEABILITY: The grinder pump core unit shall have two lifting hooks complete with nylon lift-out harness connected to its top housing to facilitate easy core removal when necessary. All mechanical and electrical connections must provide easy disconnect capability for core unit removal and installation. A push-to-run feature will be provided for field trouble shooting. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

L. OSHA CONFINED SPACE: All maintenance tasks for the grinder pump station must be possible without entry into the grinder pump station (as per OSHA 1910.146, permit-required confined spaces). "Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space."

M. SAFETY: The Grinder Pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired Grinder Pump Station shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use. UL listing of components of the station, or third-party testing to UL standard will not be acceptable.

a. The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low pressure sewer system applications. As evidence of compliance with this requirement, the grinder pump shall bear the seal of NSF International. Third-party testing to NSF standard will not be acceptable.

PART 3 – EXECUTION

3.1 FACTORY TEST

1. Each grinder pump shall be submerged and operated for 5 minutes (minimum). Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge assembly and each unit's dedicated level controls and motor controls. All factory tests shall incorporate each of the above listed items. Actual appurtenances and controls which will be installed in the field, shall be particular to the tested pump only. A common set of appurtenances and controls for all pumps will not be acceptable. Certified test results shall be available upon request showing the operation of each grinder pump at two (2) different points on its curve, with the maximum pressure no less than 60 psi. The ENGINEER reserves the right to inspect such testing procedures with representatives of the OWNER, at the GRINDER PUMP MANUFACTURER'S facility.

2. All completed stations shall be factory leak tested to assure the integrity of all joints, seams and penetrations. All necessary penetrations such as inlets, discharge fittings and cable connectors shall be included in this test along with their respective sealing means (grommets, gaskets etc.).

3.2 INSTALLATION

A. CONTRACTOR shall install grinder pump units in accordance with the MANUFACTURER'S Drawings, shop drawings and instructions.

3.3 START-UP AND FIELD TESTING

A. The MANUFACTURER shall provide the services of qualified factory trained technician(s) who shall inspect the placement and wiring of each station, perform field tests, and instruct the OWNER'S (Customer) personnel in the operation and maintenance of the equipment before the stations are accepted by the OWNER (Customer).

B. All equipment and materials necessary to perform testing shall be the responsibility of the INSTALLING CONTRACTOR. This will include, as a minimum, a portable generator (if temporary power is required) and water in each basin.

C. The services of a trained factory-authorized technician shall be provided for two days.

D. Upon completion of the start-up and testing, the CONTRACTOR shall submit to the ENGINEER the start-up authorization form describing the results of the tests performed for each Grinder Pump Station. Final acceptance of the system will not occur until authorization forms have been received for each pump station installed and any installation deficiencies corrected.

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STANDARD
LOW PRESSURE SEWER
SPECIFICATIONS

02